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"EVERY MAN IS A VALUABLE MEMBER OF SOCIETY WHO, BY HIS OBSERVATIONS, RESEARCHES,
AND EXPERIMENTS, PROCURES KNOWLEDGE FOR MEN"—JAMES SMITHSON

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LEONARD CARMICHAEL,
Secretary, Smithsonian Institution.

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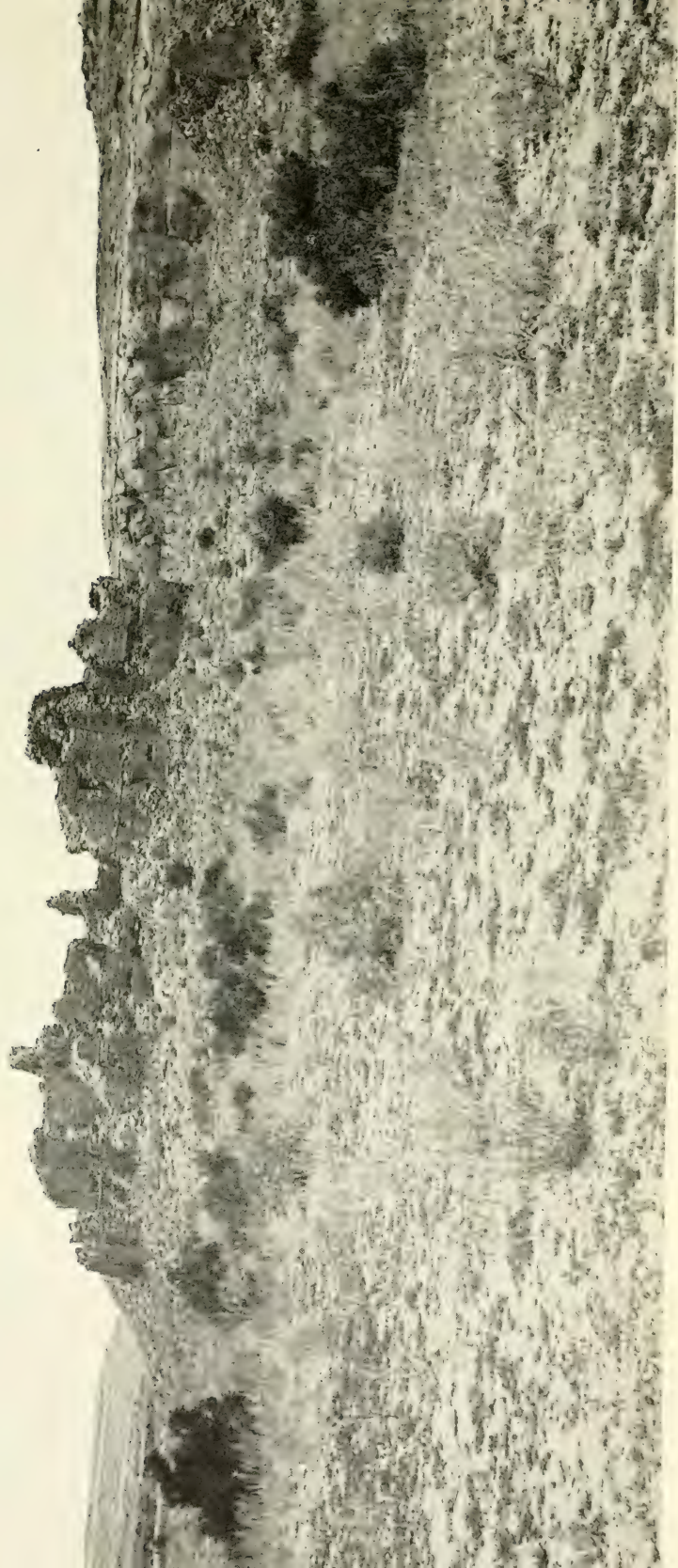


PLATE I.—The south wing of Pueblo del Arroyo from the southeast.
(Photograph by Victor Mindeleff, 1887. Courtesy of Bureau of American Ethnology.)

SMITHSONIAN MISCELLANEOUS COLLECTIONS
VOLUME 138, NO. 1

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PUEBLO DEL ARROYO
CHACO CANYON
NEW MEXICO

(WITH 55 PLATES)

By

NEIL M. JUDD

Associate in Anthropology, U. S. National Museum
Smithsonian Institution



(PUBLICATION 4346)

CITY OF WASHINGTON
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FOREWORD

This is the fourth of several articles reporting the findings of the National Geographic Society's Pueblo Bonito Expeditions. Previous numbers are:

1. Dating Pueblo Bonito and other ruins of the Southwest, by A. E. Douglass. *Nat. Geogr. Soc. Contr. Techn. Pap., Pueblo Bonito Ser., No. 1*, 1935.
2. The geology of Chaco Canyon, New Mexico, in relation to the life and remains of the prehistoric peoples of Pueblo Bonito, by Kirk Bryan. *Smithsonian Misc. Coll., vol. 122, No. 7*, 1954.
3. The material culture of Pueblo Bonito, by Neil M. Judd, with Appendix: Canid remains from Pueblo Bonito and Pueblo del Arroyo, by Glover M. Allen. *Smithsonian Misc. Coll., vol. 124*, 1954.

Subsequent reports, it is expected, will examine the remarkable ceramic complex of Pueblo Bonito and Pueblo del Arroyo, skeletal remains from the two ruins, the growth and decline of Pueblo Bonito, and certain small-house sites in the Chaco Canyon area.

The manner in which the Pueblo Bonito Expeditions came about was related in the third report, cited above. Therein I also recalled my deep personal obligation to the officers of the National Geographic Society and to the Society's Committee on Research, which had invited me to lead its 1920 reconnaissance of Chaco Canyon and, later, its investigations at Pueblo Bonito, 1921-27. In my report to the Committee in November 1920, I recognized Pueblo Bonito as the Chaco Canyon ruin most likely to contribute additional knowledge of Pueblo civilization at its height, and I recommended Pueblo del Arroyo for joint investigation because its proximity made this possible and because a low mound on the west side of the ruin and fragmentary walls exposed by caving of the arroyo bank were thought to represent an earlier, underlying structure.

Correlative expeditions in 1923, 1928, and 1929, under leadership of Dr. Andrew E. Douglass, director of Steward Observatory, University of Arizona, were prompted by our desire to learn the age of Pueblo Bonito and Pueblo del Arroyo and were eminently successful. These several expeditions were conducted under the authority of permits from the Department of the Interior, and all collections resulting from the excavations were presented to the United States National Museum. At the request of the National Geographic Society, my services for the annual fieldwork were lent by the Smithsonian Institution.

Our studies at Pueblo del Arroyo were begun early in the summer of 1923 and were continued intermittently during the following three seasons as workmen could be spared from the larger undertaking at Pueblo Bonito. Karl Ruppert, a University of Arizona graduate in anthropology and my principal assistant during the 1921-26 seasons, was placed in full charge. His excavation notes and a preliminary report submitted late in 1926 form the basis of the present volume, but they have been augmented by my own memoranda and by such data as have resulted from study of the collections since their receipt and restoration at the National Museum. Mr. Ruppert, who has gained well-merited recognition since 1930 for his researches among ruined cities of the ancient Maya in Yucatán and Chiapas, has not seen the present monograph prior to publication and is not responsible for any errors or omissions herein.

For our program at Pueblo del Arroyo Mr. Ruppert and I had the advice and cooperation of the same staff that served so competently at Pueblo Bonito. The work of excavation was performed by our crew of Zuñi and Navaho Indians. Oscar B. Walsh, C. E., prepared the ground plans, and O. C. ("Pete") Havens, of Gallup, N. Mex., took most of the field photographs. Frank H. H. Roberts, Jr., and Monroe Amsden in 1925 sorted and analyzed vast quantities of potsherds from excavated rooms and exploratory tests at both Pueblo Bonito and Pueblo del Arroyo, and some of their results are introduced in the following pages. During the summer of 1926 Henry B. Roberts assembled the information presented in Appendixes B, C, and D. Plates illustrating specimens are by Bates Littlehales, staff photographer of the National Geographic Magazine, and the text figures are from the pen of William Baake. Those showing architectural details were prepared by Harold E. MacEwen from Mr. Ruppert's field sketches. The chore of cleaning and restoring specimens in the collection was in large part performed at the U. S. National Museum by temporary workers provided in 1938 by the Federal relief agencies.

As heretofore, my coworkers at the National Museum have generously aided by identifying materials from the excavations: Rocks and minerals, by John B. Reeside, E. P. Henderson, and George S. Switzer; mammals, by David H. Johnson and H. W. Setzer; birds, by A. Wetmore and Herbert Friedmann; shells, by Harald A. Rehder; wood, by William N. Watkins; botanical remains, by C. V. Morton. My wife, Anne MacKay Judd, as always, has been of immeasurable assistance throughout; Mrs. Pearl Stello has typed the

final manuscript. Miss Anna O. Shepard, of the Historical Division, Carnegie Institution of Washington, examined our sherd collections in connection with her study of prehistoric pigments and tempering substances, and all archeologists have benefited from her observations, since published.

Mere words cannot adequately convey my sense of obligation to the officers and staff of the National Geographic Society for their unfailing interest and support throughout the years of the Pueblo Bonito Expeditions and subsequently. Without their active cooperation and encouragement this volume might have been still further delayed.

It is a pleasure also to acknowledge my indebtedness to the Penrose Fund of the American Philosophical Society for a grant-in-aid that provided for preparation of the architectural drawings herein and for the typing of my manuscript.

NEIL M. JUDD

*U. S. National Museum,
Smithsonian Institution
Washington, D. C.
December 28, 1956.*

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PUEBLO DEL ARROYO, CHACO CANYON, NEW MEXICO

By NEIL M. JUDD

*Associate in Anthropology, U. S. National Museum
Smithsonian Institution*

(WITH 55 PLATES)

I. INTRODUCTION

"A few hundred yards further down the canyon," wrote Lt. James H. Simpson in his journal (1850, p. 81), "we fell in with another pueblo in ruins, called by the guide Pueblo del Arroyo."

Simpson was a topographical engineer attached to the command of Col. John M. Washington on a military reconnaissance of the Navaho country in the late summer of 1849. The troops left Santa Fe on August 16 by way of Santo Domingo and Jemez and 10 days later camped about a mile from Pueblo Pintado, a conspicuous ruin at the head of Chaco Canyon.

The following day, August 27, camp was made about 2 miles west of Pueblo Wejegi and within sight of that noble landmark, Fajada Butte, or *Mesa Fachada* as Simpson recorded the name. Next morning Colonel Washington led his troops out of the canyon at this point and continued westward after giving Simpson permission to examine other ruins reported to be even larger than Wejegi and Pintado. For the day's adventure the lieutenant was accompanied by R. H. Kern, the artist, a Mexican guide by name of Carravahal, and seven members of the New Mexico militia. The ruins of Una Vida, Hungo Pavié, Chettro Kettle, and Pueblo Bonito provided so much of interest that the sun was already low on the western horizon when Lieutenant Simpson and his companions came finally to Pueblo del Arroyo. After only a cursory examination the party hurried on, hoping to overtake the main command before dark.

The day before, while interrogating the expedition's several guides about the origin of Pueblo Pintado, Simpson concluded that Carravahal was better informed on the subject than either of the Indians. From what was written of him I infer the Mexican was a talkative

individual and entirely uninhibited. He had ready names for 8 of the 10 ruins visited, and 5 are Mexican names. Some may have been inspirations of the moment, but others surely were familiar to Mexican traders and militiamen previously drawn to Chaco Canyon by its Navaho population. It was from a former soldier or merchant, no doubt, that Josiah Gregg learned of these same ruins and ventured a notation in which Pueblo Pintado is mistakenly called Pueblo Bonito (Gregg, 1845, p. 284). Although Gregg's reference is the older, Simpson's descriptions are based on first-hand knowledge. For this reason I prefer to retain the names he recorded at the time.

Nowhere in his journal does Simpson mention an arroyo in Chaco Canyon, but at least the beginnings of one were present on August 28, 1849. Otherwise Carravahal would not have been so quick in designating the subject of this study "pueblo of the arroyo."

In our second and third reports (Bryan, 1954; Judd, 1954) data are presented in support of the belief that what Carravahal saw was, in fact, a succession of shallow pools, some few of which may have been joined by caving of the bank between. Conditions tending toward such an intermittent channel are pictured by our older Navaho neighbors, reminiscing on the scenes of their boyhood. As these elders describe it, Chaco Canyon was a green paradise as late as Simpson's time. Perennial grasses, willows, and cottonwoods still flourished; drinking water could be had anywhere with a little digging; occasional pines grew in the rincons and on the mesas above. Within 28 years, however, all this was to be changed and the valley transformed into a wasteland. Within 28 years floodwaters were to carve a steep-walled gully that lowered the water table beyond reach of surface vegetation. Unwatered, the native ground cover would wither and die, erosion would accelerate, and Chaco Canyon once again would lose its major attraction as a place for human habitation.

When W. H. Jackson, noted photographer of the Hayden Surveys, journeyed this way in the spring of 1877 he camped at the only water in sight, a mud hole in the stream channel about 250 yards west of Pueblo del Arroyo (Jackson, 1878, p. 446). A stone's throw south-east of the pueblo he measured the depth of the channel as 16 feet and remarked that this was about twice that of an older, inactive course nearer the ruin (*ibid.*, p. 443). This older course may well be the arroyo Simpson saw 28 years earlier. In that case Jackson's "old arroyo" is the one that gave our ruin its name, and the main channel had been deepened 8 feet, and probably more, between 1849 and 1877.

The floodwaters that carved this "old arroyo" had also exposed

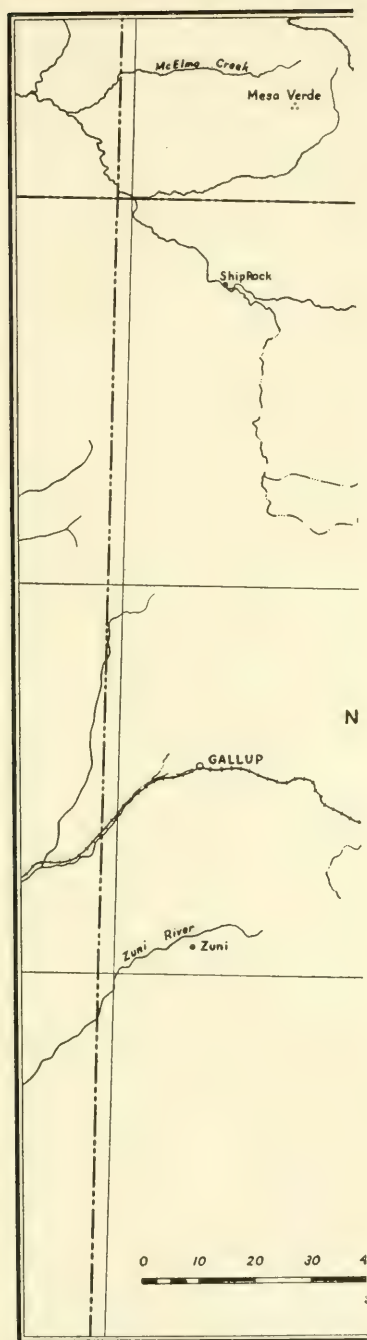


FIG. 1.—M

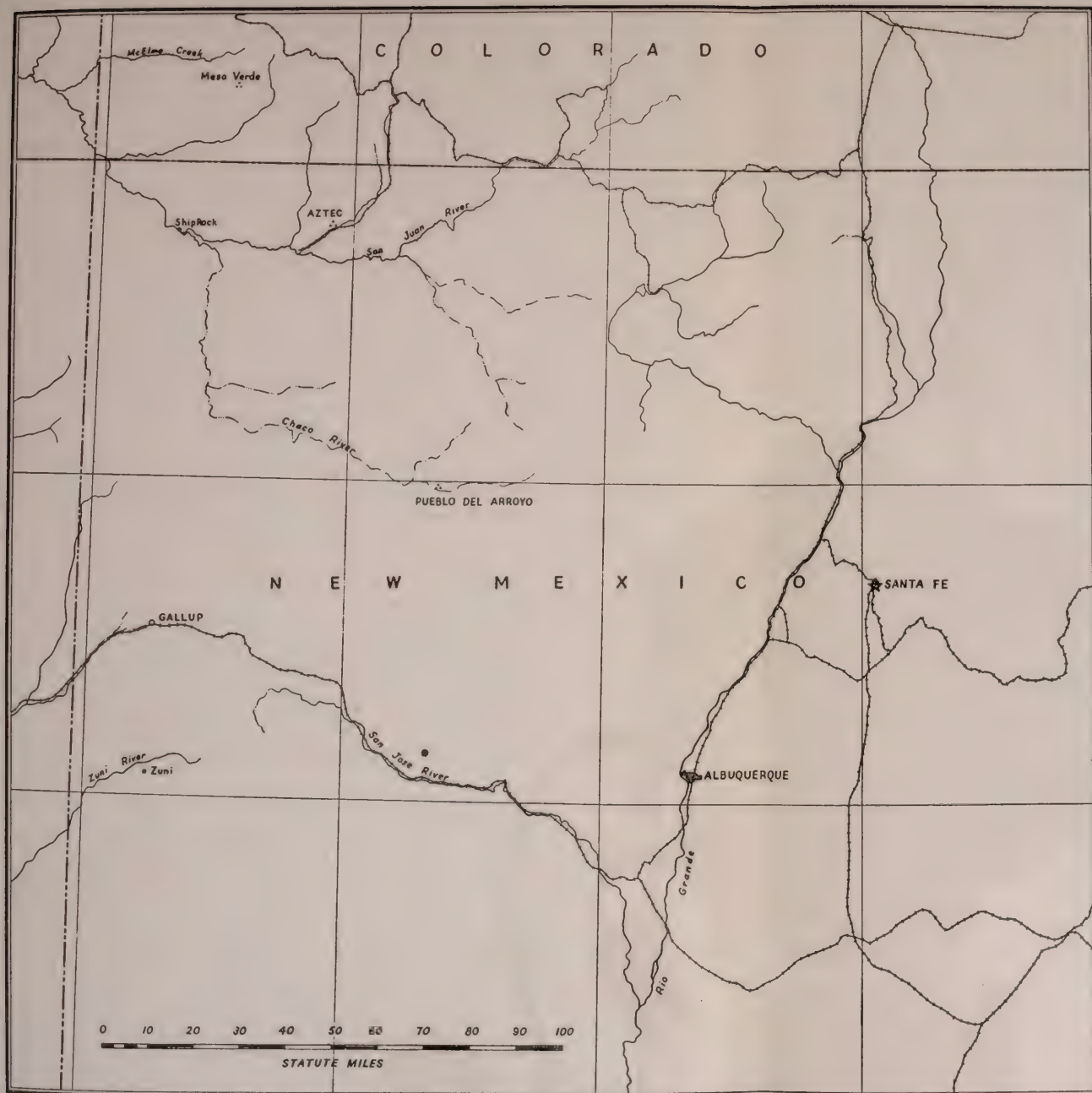


FIG. 1.—Map of northwestern New Mexico showing location of Pueblo del Arroyo.

a buried wall south of the ruin—a long, straight masonry wall not visible on the surface. Below that wall “and extending out into the main arroyo to a depth of 14 feet . . . , is an undulating stratum of broken pottery, flint-clippings, and small bones firmly embedded in a coarse gravelly deposit,” the bottom of a *prehistoric* arroyo. Here then, was a succession of three watercourses: one formed in the unknown past, refilled and covered over, a second that presumably began shortly before 1850, and a third and deeper course that had developed out of the second and within a quarter century. The keen-eyed Jackson missed very little!

In 1924 Kirk Bryan, studying the geological history of Chaco Canyon in connection with our Pueblo Bonito investigations, chanced upon a new exposure of the prehistoric arroyo discovered by Jackson and plotted its course up and down the valley a distance of approximately 5 miles. Potsherds collected on the bed of this buried channel fixed its existence as more or less contemporary with the decline of Pueblo Bonito. Indeed, as Bryan (1954, p. 47) points out, development of that ancient arroyo was undoubtedly a primary reason for abandonment of Pueblo Bonito, Pueblo del Arroyo, and other Chaco Canyon villages in the eleventh and twelfth centuries.

Late in the winter of 1887-88 Victor Mindeleff visited Chaco Canyon in connection with his study of Pueblo architecture, but his monograph (Mindeleff, 1891) includes no reference to Pueblo del Arroyo. Nevertheless, he took a number of photographs, and some of them we are privileged to publish herein through the courtesy of the Bureau of American Ethnology, Smithsonian Institution. Evidence of previous digging by unknown persons, and holes broken through walls, are to be seen in Mindeleff's photographs (pl. 15).

In 1920, the year of the National Geographic Society's reconnaissance of Chaco Canyon, there stood near the southeast corner of Pueblo del Arroyo an L-shaped building sometimes identified as “the store” and, again, as “the hotel.” It was built in 1897 or 1898 as a boardinghouse for personnel of the Hyde Exploring (or Exploration) Expeditions and later served as guest house. A smaller, rectangular building occupying a comparable location at the northeast corner of the ruin, and since removed, had been a bunkhouse for the Expeditions' freighters and riders.

Organized in 1896 for exploration of Pueblo Bonito and other prehistoric ruins, the Hyde Expeditions found themselves in the Indian trading business two years later when they undertook to supply their Navaho workmen with foodstuffs and clothing. The

trade flourished and by 1901 a dozen stores were in operation throughout the area and the expeditions' wagons were "encountered on every road in the Chaco region, hauling merchandise from the railroad to the interior and returning laden with blankets woven by the Navajos, wool and hides." (Holsinger, MS., p. 70.)

Headquarters of the Hyde Expeditions were in Chaco Canyon until 1900 or 1901 when they were transferred to Thoreau, on the Santa Fe Railway. Richard Wetherill was field manager of the company, and his residence still stands, a few feet from the southwest corner of Pueblo Bonito. The large room adjoining the residence on the west was his store or trading post. Wetherill was killed in 1910 at the mouth of Rincon del Camino, a mile west of Pueblo Bonito, and thereafter his Chaco Canyon holdings passed to a succession of owners and lessees.

In 1920 and 1921 the old Wetherill homestead and buildings were leased by Edward Sargent, of Chama, N. Mex., who grazed several flocks of sheep in the Chaco country each winter.¹ His herders were provisioned from a supply depot in charge of Ed Doonan, who lived in the one-time "hotel." Mr. Doonan's predecessors had cleared and roofed several rooms in the nearby ruin for storage and for other purposes (pl. 3, upper). Gus Griffin maintained a small store here during the mid-1920's.

Our investigations at Pueblo del Arroyo were begun in 1923 and continued during the three following summers. Work started along the outer south side (pl. 2, upper). We removed the blown sand and earth and dumped the rocks not needed for reconstruction purposes into the arroyo in hope of checking its further encroachment.

An entirely unexpected discovery during these initial activities was a series of small, secondary rooms improvised between eight buttresses built to brace the leaning south wall. These small rooms and their fittings differ so markedly from those comprising the pueblo proper I defer further consideration of them for a later chapter wherein all extramural structures are discussed together.

These external accretions, and much within the village, do not really belong in Chaco Canyon; they indicate, rather, the presence of peoples from the north, from beyond the San Juan River. Pueblo del Arroyo itself is too Chacoan to be considered of foreign inspiration or construction but there can be no doubt that the cultural pattern of

¹ Mr. Sargent's generous offer of May 6, 1921, to allow the staff of the National Geographic Society's Pueblo Bonito Expedition to occupy the former Wetherill buildings was thwarted by cancellation and transfer of his lease.

its builders came to be dominated, if not supplanted, by that of immigrants from the San Juan country. The same infiltration was apparent also at Pueblo Bonito (Judd, 1954).

While our explorations at Pueblo Bonito were in progress we commonly referred to one phase of these northern influences as "the Chaco-San Juan" because, on pottery in particular, it appeared to be an adaptation of San Juan techniques and designs to Chaco practices in the manufacture of earthenware vessels. Although the initial blending probably represented no more than appropriation of ideas carried by traders traveling to or from the San Juan, whole families and even groups of families migrated to Chaco Canyon later, sometime during the eleventh century.

Northern influences are particularly evident at Pueblo del Arroyo. The pottery we recovered there is in large measure characteristic of that area in southeastern Utah and southwestern Colorado drained by the McElmo and Mancos Valleys. The dominant wares at Pueblo del Arroyo, therefore, if not imported from the north, were made locally by potters who had learned their craft along the Mancos and the McElmo. In a recent study that includes this very region, Deric O'Bryan (1950, p. 103) dates the Mancos Mesa Phase at about A.D. 900-1050 and the McElmo Phase at about 1050-1150.

These approximations, and especially the latter, agree closely with our tree-ring data. Derived as they are from annual growth rings of trees felled for construction purposes, tree-ring dates from a given building provide an approximation of the age of that building. However, such dates are not always to be taken at face value because timbers were often salvaged from abandoned houses and reused. The labor of felling a tree with stone axes and transporting its trunk by manpower to the building site explains why old logs should have been reclaimed whenever possible. Nevertheless, there must be significance in the fact that the 31 datable timbers we recovered at Pueblo del Arroyo were all cut between A.D. 1052 and 1103 (Douglass, 1935, p. 51). Smiley (1951, p. 19) extends the bracket to 1117.

Ten timbers from the middle section of the village show a range of from 1052 to 1090. Evidences of alteration and reconstruction are more numerous here than elsewhere. Changes in Kiva E, it is interesting to note, necessitated a new north wall in Room 46 but left one of the original ceiling beams undisturbed. That beam, dated 1072, was propped up, at the time the change was made, with another log cut 20 years earlier. In the south wing, where 17 beams gave cutting dates between 1067+x and 1103, it is noteworthy that 11 were felled

during four years, 1100-1103. Five timbers from the unexcavated north wing bear dates of 1065, 1075, 1101, 1101 ± 2 , and 1117. Our 31 tree-ring dates suggest, therefore, that Pueblo del Arroyo was built when the Mancos-McElmo culture flourished north of the San Juan. That carriers of this culture came to dwell in Pueblo del Arroyo is proved both by the predominance of their characteristic pottery and by the presence of an adjacent, uncompleted McElmo Tower. No Chaco group could have made that pottery, and none would have undertaken construction of a building so foreign to its established architecture as a triple-walled tower.

In general the masonry of Pueblo del Arroyo corresponds with Type III at Pueblo Bonito (Judd, 1927b, p. 562; 1954, p. 19). There are, however, marked divergences here and there. Some walls appear to have been built of second-hand materials; some exhibit more or less banding with dressed blocks of friable sandstone while others may include sections composed of selected laminate sandstone in the manner of Bonitian Type IV. Although Pueblo Bonito architecture is reflected in the construction of Pueblo del Arroyo the reflection is blurred and imperfect. As a whole, Pueblo del Arroyo masonry impresses one, to quote Ruppert, "as being the product of many individuals each of whom built according to his personal preferences but with left-over materials, the choice building stones having been utilized elsewhere."

In ground plan Pueblo del Arroyo consists of a block of massed rooms with eastward extensions at each end and the extensions connected by a semicircular series of one-story structures enclosing a court (fig. 2). The outer west wall of the pueblo is 268 feet long. The block of rooms comprising the south wing measures 75 feet north and south by 131 feet east and west, and portions of fourth-story walls still stand. A corresponding wing on the north is a trifle shorter but wider. The area occupied by the building and its court is thus slightly more than $1\frac{1}{8}$ acres.

While both wings were rectangular blocks of rooms standing three or four stories high, the massed structures between the wings were terraced down from the higher west side to a single story overlooking the court. Ground-floor rooms, being dark and poorly ventilated, were utilized primarily for storage; those in the upper stories, for residential purposes. In the pages that follow, the letters B, C, and D will indicate rooms in the second, third, and fourth stories, respectively.

We estimate 120 secular rooms on the ground floor of Pueblo del Arroyo and these, together with 86 known second-story and 64 known

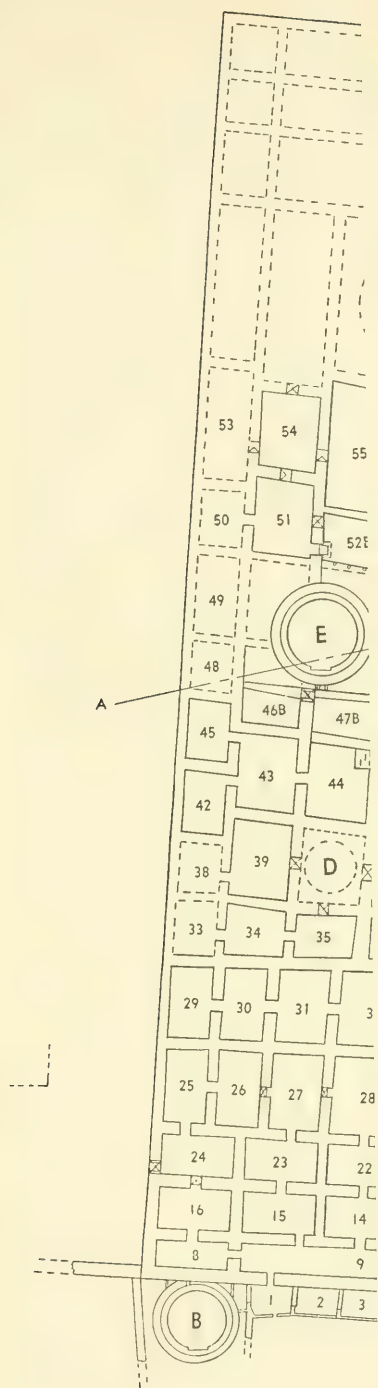


FIG. 2.—Ground

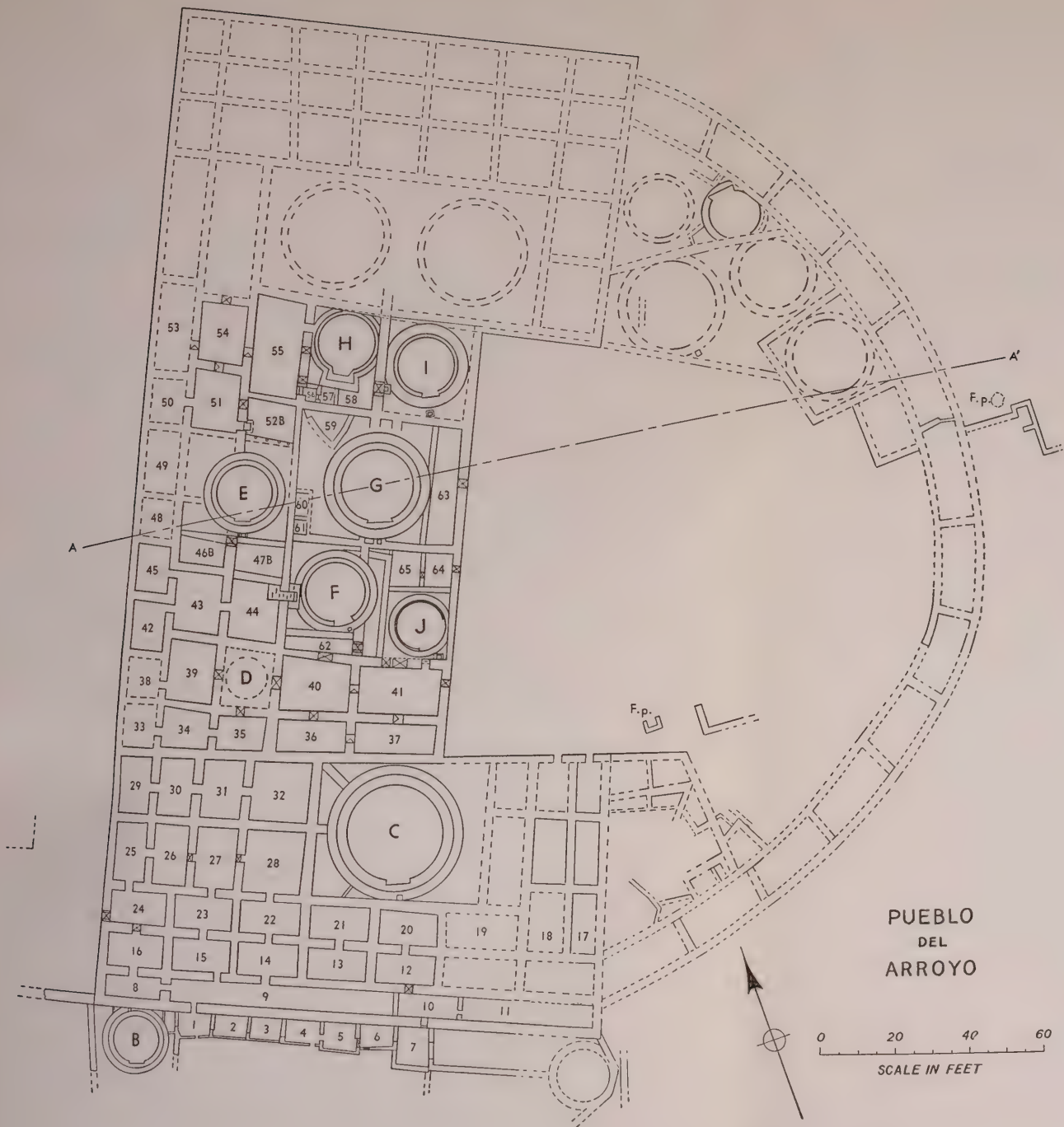


FIG. 2.—Ground plan of Pueblo del Arroyo. (From the original survey by Oscar B. Walsh.)

third-story rooms and 14 suggested by surviving fourth-story walls, would give a total of 284 for the village as a whole. On the basis of three rooms and five individuals per family, we estimate a maximum population of 475.

Of those comprising the pueblo proper, we excavated 44 ground-floor rooms and 7 kivas. Fourteen rooms, 11, 17, 18, 19, 22, 33, 38, 42, 45, 48, 49, 50, 52, and 53, were numbered but not excavated. These and all unnumbered rooms were purposely left for the future. Our final season, that of 1926, was devoted entirely to structures beyond the west wall—structures to be considered in chapter IV. Our descriptive text will not cover all excavated rooms, but available data on those omitted are given at the end of this volume. Here, too, if not in the text, we will identify rooms previously opened by unknown persons.

In the village as originally constructed there was only one outside door as far as I know, that in the west wall of Room 24, and this had been sealed early. If a gateway once opened into the court from the east, as Holsinger thought (MS., p. 51), it was not disclosed by our corner-searching. Pueblo del Arroyo, therefore, was a walled town, and the only conceivable reason for a walled town in Chaco Canyon was fear of aggression. The same fears were felt at nearby Pueblo Bonito where the town's defenses had been strengthened repeatedly as the years passed. Recurrent enemy attacks and discontent caused by a dwindling food supply are two understandable motives for the decline and disruption of Pueblo del Arroyo.

II. RESIDENTIAL QUARTERS

In the pages that follow I shall describe a number of rooms that seem significant for one reason or another. Some are former dwellings, some had served for storage, some are of interest from the architectural point of view, and some because of what we found in them. To avoid the monotony of repetition, dimensions and room fittings are listed in Appendixes B and C.

With the exception of Rooms 1-7 which are intrusives and, as such, will be reserved for Chapter IV, Pueblo del Arroyo dwellings show a surprising uniformity in size. This, despite the disparity between Room 35, the smallest, measuring 8 feet by 12 feet 8 inches, and Room 55, which is 13 feet 2 inches wide by 25 feet 9 inches long. The average of those we excavated, 44 in number, is about 11 by 13½ feet.

Room 8 stands at the extreme southwestern corner of the pueblo as originally planned, that is, before Kiva B and its associated rooms were added.

A few years prior to my 1920 visit, to approximate time by the amount of blown sand that had settled within its walls, the west half of the second-story room had been cleared by treasure hunters. They had broken a hole through the southwest corner of its floor (pl. 4, B) and thus gained access to the lower room which they found in an excellent state of preservation and relatively free from accumulated rubbish. If the original inhabitants abandoned anything here, the record has been lost for we recovered nothing but a single bone bead and part of an awl.

A door in the north wall of this lower room, 8A, connects with Room 16 and thence with 24 and 25. The lintel of that door consists of eight pine poles about 3 inches in diameter; 4 inches below them and 5 inches back from the wall face, a single secondary lintel pole had served to support a doorslab or curtain. On the west, flush with the northwest corner and 6 feet above the floor, a ventilator admitted fresh air from the outside. At the east end of the room our treasure hunters had forced their way through an apparently sealed door only to be dissuaded from going farther by ceiling-high debris in Room 9A. The same intruders had also pried a number of stones out of the south wall revealing two pine logs, 6 inches in diameter, laid in horizontally as longitudinal tie beams or stays completely enclosed by the masonry. We learned subsequently that this method of strengthening walls was

in common use at Pueblo del Arroyo. Except for the hole broken through from above, the ceiling of 8A was intact.

Rooms 8B-I and B-II. For some undiscovered reason the room over 8A had been divided into two unequal parts by a masonry partition (pl. 4, B). The eastern part, 8B-I, is the larger of the two, and its south wall is 4 inches longer than the north. The partition, 8 inches thick and composed of irregular blocks of sandstone strengthened by two built-in pine posts, left 8B-II completely isolated except for a possible hatchway to the third story. That the partition was a late introduction is suggested by the presence of two south doors in 8B-I, both giving access to the flat roof of Kiva B. The westernmost of these two may have replaced the other when a shallow, adobe-rimmed fireplace was built directly below its east jamb. When we uncovered it the fireplace was still filled with wood ash, and plaster below the door-sill was dark with soot. An unusual feature of this particular hearth was the presence of two circular depressions, each about 5 inches in diameter and an inch deep, at the northeast and northwest corners, presumably as pot rests. Precautionary measures against the possibility of fire are evidenced by an unusually thick adobe flooring about the fireplace and over the underlying layers of bark and split cedar.

Between the north door, which had been closed with masonry, and the northeast corner two sandstone slabs had been embedded in the floor and rimmed with adobe mud to create a shallow basin somewhat resembling those designed for grinding meal (pl. 4, A). But in this instance the basin abuts the wall, and its floor slabs show no evidence of grinding. Through the east wall a T-shaped door that formerly opened into Room 9B-III had been partly blocked to leave a 12-inch-deep recess on the 8B-I side.

Smoke-stained plaster still adhered to all four walls of 8B-I. The room had been abandoned and a small amount of sandy debris had collected before its ceiling collapsed. Broken ceiling poles, split-cedar shakes, and 5-inch-thick chunks of adobe flooring provide clues to construction. Some of the poles were slightly charred but destruction by fire is not indicated. In and under this wreckage we found pieces of tanned but unidentifiable skins, yucca-fiber cord, a drilled bone awl, a small quantity of human hair, and fragments of two sandals, one plaited (fig. 3) and the other woven. This latter, apparently of apocynum fiber, bears a design in color on the upper surface and, on the sole, a raised pattern produced by knotted threads. It is of a type commonly attributed to an earlier civilization than that represented by Pueblo del Arroyo.



FIG. 3.—Sandal fragment from Room 8B-I. (Drawn by Hashime Murayama.)

On the floor in the southeast corner we found a piece of selenite an inch and a half long and a cube of lead ore, both unworked. Elsewhere in the room were a couple of hammerstones, half a mano, a handful of potsherds, a door-slab that had been briefly used as a metate (shown leaning against the wall in plate 4, A), and part of a sandstone-abraded plank 7 inches wide, 4 inches thick, and about 2 feet long. The doorslab, at least, appeared to have fallen from the third-story room.

Room 9A, adjoining Number 8 on the east, is noteworthy for its exceptional length. Originally 111 feet long, it was subsequently reduced to 58 feet 3 inches upon installation of the partitions creating Rooms 10 and 11. The reduced room measures 5 feet 10 inches wide at the east end; 6 feet, at the west. Since we cleared only the west end of it, Room 11 may be divided by a possible third partition.

Whatever the idea behind it, Room 9 as originally planned was an architectural mistake, a fact its builders soon discovered. Its south wall began to settle outward even while under construction and, in an effort to correct the error, eight low external buttresses were hastily erected. Less than a foot of constructional debris—stone spalls and mortar droppings—had collected on the surface when those buttresses were installed. That the wall was leaning even before it reached ceiling height is obvious from the fact that the partitions setting off Rooms 10 and 11 are 5 inches wider at the top than at floor level. The north wall likewise leaned southward but to a lesser degree (pl. 5, right).

Blown sand and debris of occupation filled 9A almost to its ceiling. Beneath and among this debris we found such typical tools and discards as pieces of worked wood, bone, shell, and stone, 3 sandstone disks or jar covers, 11 hammerstones, 10 manos, 1,357 miscellaneous potsherds for study, and fragments of a willow screen. On the floor close in the northwest corner lay a handful of turquoise and shell chips from some jeweler's workbench.

At the west end of the room we came upon the partially disarticulated skeleton of an adult male (U.S.N.M. No. 327141). The skull had been crushed and some of the long bones thrown to one side. The left half of the upper jaw was recovered several feet farther east, about midway of the room and a foot above its floor. To our surprise that fragment was the remainder of an upper jaw (field No. 89) we had found 6 weeks earlier among broken masonry a foot and a half above floor level in the middle of Room 3. Thirty-three inches of solid masonry separates the two rooms.

Doors connect 9A with Room 15 on the north, Room 8 on the west, and Room 1 on the south. The latter, like Room 3, is one of several rude dwellings built against the outer south wall of the pueblo some years after its completion, and the connecting doorway came still later. The west door, which we restored, is believed to have been blocked with masonry, perhaps at the time the adult male was buried, for the treasure hunters who broke through from 8A had destroyed most of the frame in their enthusiasm. A clay-lined hearth lies in the middle of the floor, 24 feet 3 inches from its east end.

Absence of facing stones from an irregular area about 15 feet from the northeast corner suggests an intended north door to connect with Room 13. The missing stones were not present in the debris below, so we brought in others and refaced the area as a security measure.

Rooms 9, 10, and 11 resulted from the partitioning of an exceptionally long room. Their second stories include, not three, but six rooms, and each of the five masonry walls separating them rests upon paired beams at second-story floor level rather than upon first-story stonework. Three of the six rooms overlie most of 9A and have been designated, beginning with the easternmost, 9B-I, 9B-II, and 9B-III. Figure 4 illustrates the relationship of the group. Neither the east nor the west wall of Room 10A supports a second-story partition.

Rooms 9B-I to 9B-III connect with those adjoining on the north but not with each other. All three had been lived in, for smoke-stained plaster still adheres to their walls. The floors of 9B-I and 9B II had collapsed under the weight of masonry fallen from above, but a remnant survived in the southeast corner of 9B-II and here we found a number of discards, some of them partially embedded in the adobe flooring: the reworked handle of a dipper (U.S.N.M. 334678), 2 bone awls (No. 334906), a clay figurine (fig. 37, a), 2 reworked pieces of wooden tablets (pl. 38, i; No. 334702), a scrap of cotton cloth (No. 334715), and a bit of kaolin. The very diversity of these items suggests that they were among household rubbish dumped

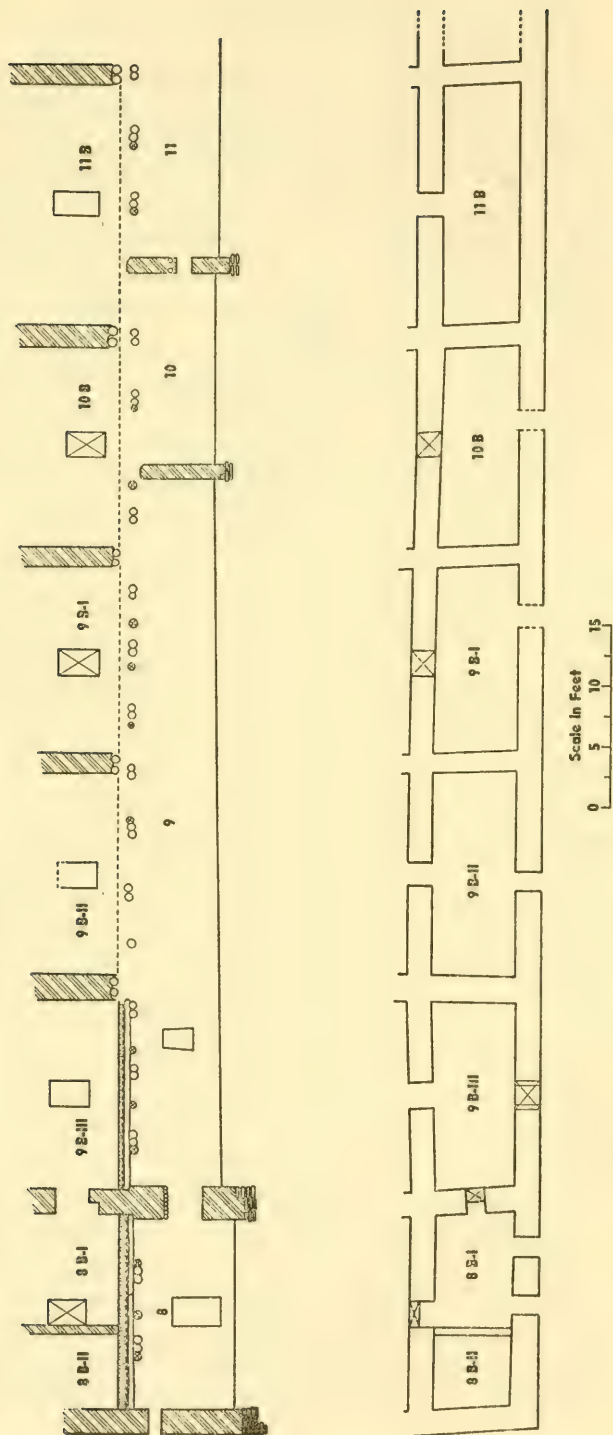


FIG. 4.—Floor plan and profile of Rooms 8-11, first and second stories. (From the original survey by Oscar B. Walsh.)

upon a rain-soaked pavement and pressed into it by the overburden. Also present was part of a sandstone mano that had been used in preparing azurite pellets for blue paint.

Portions of third-story walls still stand here, and it is barely possible there was once a fourth story.

Room 9B-III is best preserved of the three. Perhaps because its supporting poles were not firmly seated, the floor next to the east wall had settled 4 inches at one time, causing an unevenness that was corrected by spreading a new layer of mud upon the old, thus bringing the east third up to level.

A rectangular door opened into Room 15B, and another, this one T-shaped, connected with 8B-I, next on the west. A second T-shaped door gave access to the roof of Room 1B. The lower part of this latter door once extended to the floor, but subsequently the sill was raised to a height of 18 inches and then, for someone's convenience, an adobe step, 24 inches wide, 3 inches high, and with an 8-inch tread, was built immediately below.

Between this doorstep and the southwest corner of the room is a semicircular fireplace, rimmed with adobe mud. Opposite, abutting the north wall, partially sunk into the floor and extending out into the room 33 inches, is a double receptacle—two shallow basins, one before the other, and separated by a 2-inch-thick adobe partition. The southernmost basin, paved with an oval sandstone slab, is enclosed on three sides by an adobe rim, 5 inches thick and 4 inches high, bearing imprints of juniper splints and inch-thick poles.

This double basin, the fireplace against the south wall, and the smoke-blackened plaster unite in identifying Room 9B-III as family living quarters. A sandstone metate, 16 inches long and 15 inches wide, lay upon the floor in the northeast quarter. While clearing the room we also noted 2 worn hammerstones, a modified flint flake, 4 worked sticks and part of a spindle shaft, a scrap of mammal skin, part of a blue macaw feather, and an unidentifiable quill with a bit of yucca cord attached.

Because the floor of 9B-III is part of the original ceiling of Room 9A and in an excellent state of preservation (pl. 5, left), it seems desirable to examine it closely since it illustrates the predominant method of ceiling construction at Pueblo del Arroyo.

When the builders had raised the first-story walls to the height desired, in this instance 7 feet above the floor, they placed paired beams in position across the width of the room. The surviving beams average 8 inches in diameter, and the spacing between pairs averages

49 inches. These beams were laid directly upon the sandstone-and-mud masonry without use of wall plates. Next, paired poles about 3 inches in diameter at the butt were laid upon the beams and at right angles to them, that is, lengthwise of the room. Since such poles are plainly visible in any ceiling construction seen from below, I prefer to describe them as "ceiling poles." In this particular instance they average about 7 feet long and their diameters decrease from 3 to between 1 and 2 inches at the lesser end. To equalize this difference the builders placed each pair butt to tip and the pairs about 6 inches apart. At the west end of the room the poles are tenoned several inches into the masonry.

Immediately upon the ceiling poles and at right angles to them is a layer of juniper splints, each piece being about 2 feet long and from 1 to 2 inches wide. Like the poles supporting them, many of these splints have an end built into the stonework, ample proof that wall construction proceeded as the several parts of the ceiling were being brought together. To hold the layer in place, single splints were laid crosswise over it at intervals corresponding to the paired ceiling poles beneath and were lashed tightly to the latter with yucca-leaf thongs. Then followed a layer of juniper bark and, finally, about 5 inches of adobe mud, packed and smoothed on top. Thus, the western part of the ceiling of Room 9A became the floor of 9B-III. Excluding the 8-inch supporting beams, the whole assemblage here is 10 inches thick, an approximate average.

Upper rooms are usually a trifle larger than those directly beneath. 9B-III, for example, is about 10 inches wider than 9A owing to the presence of two floor-level ledges or offsets that average, respectively, 4 inches wide on the north and 6 inches wide on the south. Apparently the layers of cedar splints and bark overlying the ceiling poles so concealed the face of the lower wall that the masons were not always able to keep its upward extension in alignment—if they wished to do so. Less frequently an upper wall overhangs the lower by an inch or two. There may be offsets at the ends of a room as well as at the sides.

Two 8-inch logs rest upon the second-floor offsets and carry the weight of the east wall of 9B-III. The masonry comes down on both sides completely to conceal the two logs. Similarly, paired timbers supported the other four second-story partitions in this room series. Like those employed in ceiling construction, wall-supporting beams usually extend entirely through the masonry on either side of a room and end flush with the opposite wall face. It seems likely each log

was measured for correct length before being positioned. Rarely is there any excess. One exception: an extra 13 inches on one of the logs under the east end of 9B-I extended through the north side and was hidden in the wall between Rooms 12B and 13B. A flint chip was often used to draw a ring around a log—a line to which the builders then hewed with their stone axes. More surprising still, the ax cuts were customarily erased with sandstone abraders.

Timbers supporting these second-story partitions provided tree-ring dates that help fix the time when Pueblo del Arroyo was building. Several beams had decayed, and in one instance the annual growth rings were of such uniform thickness they could not be read, but six others gave the following cutting dates: A.D. 1097+x, 1100 (two), 1101, 1102, and 1103. With steel-ax-hewn logs from the Smith Lake region south of Crownpoint, we replaced the rotted beams under the partition between 9B-I and 9B-II and rebuilt the wall above (pl. 5, left).

Room 10A, as previously stated, came into being when two partitions were introduced into an abnormally long room, the original 9A. Like the latter, 10A was utilized for a time as living quarters, for there is a slab-lined fireplace in the middle east half of the floor and the wall plaster is sooted from fires that once burned in it. The lining slabs stand upon an earlier floor 7 inches lower and the space between is packed with adobe spalls and sand.

A remodeled doorway of more than usual interest pierces the south wall 7 feet 4 inches from the southeast corner. As we interpret its puzzling features, the opening was originally 25 inches high, 18½ inches wide at the lintels, and 20 inches wide at the sill which remains 17 inches above the later floor. Presumably after construction of Room 7 this opening was neatly closed from the outside with stonework matching the exterior masonry but leaving a 24-inch-deep recess, full height in Room 10A. Then a larger, substitute doorway was cut through above, giving access to the roof of Room 7, and two of the former lintel poles were repositioned to serve, together with the sill of the recess, as steps to the substitute opening with its sill at a height of 4 feet 4 inches (fig. 5).

Under household debris in the northeast quarter of 10A, between 2 and 6 inches above the floor, we recovered the disarticulated skeleton of an adult male (U.S.N.M. No. 327139). Like that in Room 9A, its skull had been crushed and there was no accompanying burial furniture. From the waste surrounding the Room 10 skeleton we recovered 447 miscellaneous potsherds, 7 manos, 14 hammers, and a few lesser artifacts.

With two and possibly three stories above them, Rooms 9 and 10 normally would have been utilized for storage. But both had been plastered and provided with fireplaces, fixtures not typical of store-rooms, and their walls are still smoke blackened. Although dark and ill ventilated, the fact that these two had been lived in reminds one of an observation recorded by Mindeleff (1891, p. 103), namely, that the Hopi formerly moved from the upper stories to ground-floor rooms each fall in order to economize on fuel consumption during the winter.

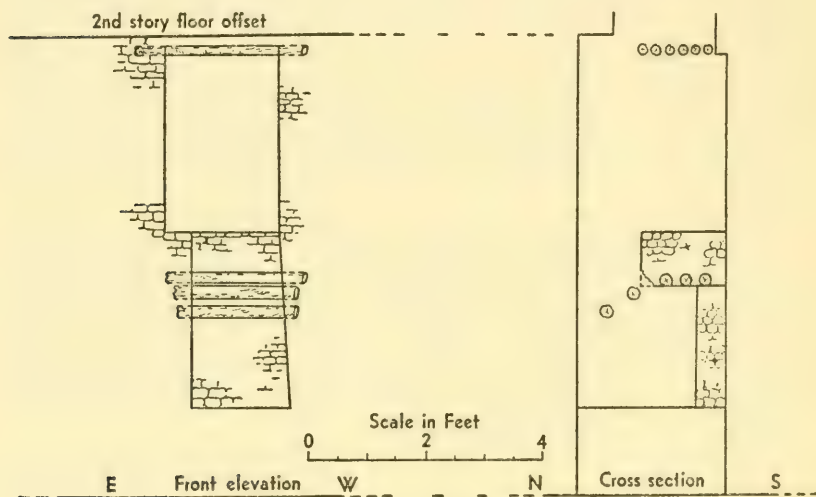


FIG. 5.—Remodeled south doorway of Room 10A.

Room 11A was not excavated. We merely cleared a narrow strip at the west end in order to note floor level and wall relationships. In this limited area, however, we unearthed the skeleton of an adolescent (field No. 154), sex not determined, three bone awls (U.S.N.M. No. 334890), and a bone scraper (pl. 37, s). Here, as with the two adults buried in Rooms 9 and 10, there was no recognizable burial offering.

Rooms 12-24. Adjoining Rooms 8 to 11 on the north, a series of paired rooms extends lengthwise of the south wing. With the possible exception of the easternmost, which we did not explore, each pair has a connecting doorway; in addition, the two pairs at the west end of the series also connect with rooms both north and south. Ceiling height varies from 6 feet 1 inch in Room 13 to 6 feet 10 inches in Room 16, and averages 6 feet 5 inches. There were no subfloor walls.

The masonry of this group is among the best in the village but is rather mixed as to type. Lamine sandstone predominates but there is wide use, in some walls more than in others, of dressed blocks of friable sandstone. Chinking with small chips is at a minimum. The uniformity of first-story rooms was largely repeated in those of the second and third stories. Many of the upper walls had fallen, in whole or in part, but the quantity of fallen masonry does not, in my opinion, indicate a fourth story for the entire group.

We excavated 9 of the 12 ground-floor rooms in this series. None had been utilized as a dwelling; none had plastered walls; one only, Room 20, boasted a fireplace and that is an 11-inch-square box built into the east end of an oval depression, 5 feet 4 inches long by 57 inches wide by 11 inches deep, burned but containing no ash, and subsequently floored over except for the 11-inch-square box mentioned. Only one room, 24, had been provided with a ventilator and that in the west, or outer, wall 5 feet 10 inches above the floor. It apparently was short-lived for it had been neatly sealed from the outside with matching masonry. A T-shaped door in the same wall had likewise been blocked but with no attempt toward disguising.

Parts of crushed ceilings were present in Rooms 12, 16, 20, and 23. The customary sequence of beams, poles, juniper shakes, bark, and adobe mud was varied only in Room 20, where the bark had been omitted. At the east end of this room the ceiling had settled but without destroying a corner hatchway (pl. 6, A). Opposite, at the west end, about 4 feet of ceiling remained intact, forming an open space beneath. Pot hunters had discovered this hollow and from it had cut a hole into Room 12—damage that we repaired.

The hatchway in the southeast corner measured 25 by 37 inches; its western end was formed by the eastern main beam, 37 inches from the wall, and its northern margin by one of the ceiling poles. On the east the opening was bordered by two pine poles about 4 feet long. Since their square-cut ends abutted the south wall instead of being tenoned into it, and were not supported from below (we propped them for the photograph), the two poles must have been held in place solely by the weight of the 5-inch layer of adobe flooring that covered the north half of them. Similar hatchways doubtless were far more common at Pueblo del Arroyo than our data indicate. One probably connected the first and second stories of Room 21 whose surroundings are identical with those of 20.

Room 20 was largely filled with blown sand that apparently had been carried in purposefully and dumped through the second-story

hatchway. Other than a hatful of miscellaneous potsherds, no artifacts were present. But on the floor and under the sand lay the skeleton of a puppy.

A youth of 15 or 16 had died on his sleeping mat in the middle of Room 13A. Before decomposition was complete vandals had entered the room, kicked the right pelvis to one side, and thrown the left leg against the south wall, 4 feet away (pl. 13, A). Shortly thereafter sand began to accumulate in the southwest corner, doubtless washed in through a hole in the ceiling, and as the pile grew it spread across the floor to fill the body cavity of the skeleton and half cover the skull.

Under the torso a mat of plaited rushes had left its imprint in the adobe floor; the form of a coiled basket $4\frac{3}{4}$ inches in diameter was preserved in the sand near the skull; at the left of the body and paralleling it was the partial impression of a long, unidentifiable object made of willows and reeds. Floor sweepings, including wood ashes and a small quantity of potsherds, had been dumped through the north door until they formed a considerable pile. Subsequently wall masonry and flooring had crashed through from above, half filling the lower room. From among this wreckage we recovered a single artifact, a crude sandstone disk 4 inches in diameter.

Parts of an adult female skeleton were scattered among fallen masonry or debris of reconstruction throughout the eastern half of Room 21A and from 2 to 3 feet above the floor.

Room 15 was of particular interest to us because of its diversified contents, mostly fallen from the second story. These are:

	Plate	Figures
3 bowls	22	d-f
1 pitcher	28	f
2 ollas	30	a, b
4 cylindrical vases	24	f
		a-c
1 "feather box"	24	j
2 seed jars	29	g, h
1 corrugated pot	32	d

In addition to the vessels, we unearthed two small hammerstones, three worked flakes (U.S.N.M. No. 334792), part of a shell pendant (*Conus interruptus* Brod.) from the west coast of Mexico (No. 334734), 406 tabulated potsherds of which 8.9 percent were Chaco-San Juan, and fragments of two human femurs (field No. 118).

Room 16 lies north of 8 and west of 15. Its ceiling, though broken, was a typical one: two pine beams across the width of the room, their ends firmly seated in the north and south walls 6 feet 10 inches above

the floor; 16 selected pine poles lying east-west upon the beams; at right angles to the poles, a layer of juniper shakes, then juniper bark and, finally, a layer of adobe mud to provide a floor for the room above. When the second- and third-story west walls gave way, much of their stonework crashed through the second-story floor into the lower room and forced to one side a squared pine timber that may have propped a previously cracked beam.

That timber is unique in Southwestern archeology as far as I know. It measures 5 feet $10\frac{3}{4}$ inches long by $8\frac{1}{2}$ inches wide by $5\frac{1}{2}$ inches thick and thus closely approximates the ax-hewn railway crossties of 50 years ago. Indeed, more than one camp visitor mistook it for a crosstie before attention was directed to its stone-ax-cut ends and sandstone-abraded sides (pl. 39).

As found, the timber leaned against the south wall in a way that brought its lower end near, but not directly under, the break in the western ceiling beam (pls. 7, A; 8, A). Although our initial thought was of a prop for a beam already cracked and sagging in the middle, there was no imprint of the squared end in the adobe floor and we observed no stone identifiable as a pedestal. Actually, the lower end was $1\frac{1}{2}$ inches above the floor, completely surrounded and weighted down by the broken masonry and debris fallen from above. Nevertheless, our initial guess may have been correct, for in length the timber is just a foot less than the height of the beam-end seatings.

The only other items found in the wreckage of Room 16 were parts of a decayed willow screen, five sections of peeled willows each 14 inches in length, flint cut and broken at both ends (pl. 38, *a*), pieces of yucca-fiber cord, and a number of adult human bones. The screen, originally about 28 by 37 inches, consisted of dressed willows sewed together at intervals of $4\frac{1}{4}$ inches (pl. 7, B).

Above the broken second-story floor we collected part of a spindle shaft; part of a squared and abraded pine plank $2\frac{1}{4}$ inches wide by $1\frac{3}{8}$ inches thick and still 32 inches long; and what appears to be a section cut from a bow made of mountain mahogany (pl. 38, *d*). Smoothed with fine-grained sandstone, the piece is 20 inches long and $\frac{7}{8}$ inch in diameter at the rounded butt. Here minute nicks left by a flint flake show how the shaft was girdled preparatory to breaking. An irregularity at the opposite end has been smoothed but there is no bowstring nock.

Room 23, like 15 next on the south, was practically empty when its ceiling collapsed under weight of masonry fallen from above. Indeed, at the west end of the room ceiling poles and their overlying layer of

split juniper still stood, pressed flat against the wall as our examination began. Blown sand had accumulated among and upon the broken timbers and fragments of adobe flooring. In this mixture, clearly fallen from one of the upper stories, were five remarkable sandstone tablets and several other artifacts.

The five tablets are remarkable for their uniform thinness (average, $\frac{3}{8}$ inch) and for the perfection of their workmanship. Four are shown on plate 42, *d-g*; the fifth, more shattered than the others, was not photographed. All are rectangular (average $15\frac{1}{16}$ by $8\frac{9}{16}$ inches) and of very fine-grained calcareous sandstone (or siltstone); all were broken in falling. Two are slightly discolored by smoke and one bears the stain of twilled matting. The opposite side of this latter tablet is as clean as its companions.

With these five tablets was one of dark gray carboniferous limestone, discoidal in shape and weighing $7\frac{1}{8}$ pounds in its present fragmentary condition (pl. 42, *i*). A sixth rectangular tablet (pl. 42, *j*), from adjoining Room 27, is made of this same slaty rock which is not known to occur between the Zuñi uplift, in the Fort Wingate section of New Mexico, and Durango, Colo., an air-line distance in either case of over 50 miles from Pueblo del Arroyo.

These seven stone tablets evidence skill and boundless patience. They were reduced to their present form solely through abrasion. None exhibits any mark that might suggest a clue to its original use. Since those of sandstone, especially, were too fragile for any conceivable utilitarian purpose, it is our guess that all seven were employed in ritualistic observances of the unnamed clan that occupied the suite of rooms connecting with Room 23.

Our surmise is strengthened by the number of other unusual stone and earthenware artifacts recovered from these same rooms—artifacts not to be confused with ordinary culinary utensils. As is well known, Pueblo Indians still store the ceremonial paraphernalia peculiar to each society in dark, interior rooms of the house recognized as the ancestral home of that society. Fewkes (1904, pp. 104-106) reports the use of painted slabs on Hopi altars and the finding of similar slabs in prehistoric ruins; Morris (1919, p. 24) describes polished slabs from Aztec Ruin that seem entirely comparable to those before us. Of our seven, however, only one (pl. 42, *d*) bears any trace of paint and that is a yellow wash applied to one side only.

It is noteworthy that although 13 pottery vessels were recovered from Room 15, adjoining, none was found in the wreckage of Room 23. However, in addition to the tablets described above, we un-

earthed half a sandstone doorslab on which yellow, then red, ocher had been ground for paint; a sandal-shaped tablet (pl. 42, *h*); a grooved stone ax made from a quartzite cobble, flat on one side, still pitted by the hammerstone with which it was shaped, but spalled at the bit through carelessness (pl. 41, *b*); a sandstone jar cover and parts of three others; a plug of sandy clay, burned but still friable, for a storage jar whose orifice was exactly 3 inches in diameter (pl. 40, *w*); a single white flint arrowhead (field No. 112); two crude handstones for smoothing adobe floors; an unfinished metate (U.S.N.M. No. 334856); a couple of manos and two metates that are much narrower than those characteristic of Chaco Canyon.

The smaller of these two milling stones measured $13\frac{1}{2}$ inches long by $1\frac{3}{4}$ inches thick, by 6 inches wide at one end and 7 inches at the other. Its mano groove was $10\frac{1}{2}$ inches long, $4\frac{1}{2}$ inches wide, and $\frac{1}{2}$ inch deep. The second metate measured 16 inches long, 1 inch thick, 6 inches wide at one end and $10\frac{1}{2}$ at the other. We left these in the room where found and, with them, a "lap stone" 14 by $9\frac{1}{2}$ inches by $1\frac{1}{2}$ inches thick. Tool marks and worn areas on the sides of this specimen identify it as a sort of portable work table.

Our observations in this series of ground-floor rooms, 12 to 24, suggest they were utilized primarily for storage. None had plastered walls; only one, Room 20, was provided with a fireplace and this was plainly of later introduction. The north doors in Rooms 12 and 16 still preserved secondary lintels for support of doorslabs. A youth had died on the floor of Room 13; an adult female apparently had been buried on a partial fill in Room 21 since her scattered skeleton was found from 2 to 3 feet above the floor. A third interment may have been made in front of the partially blocked south door in Room 24 because here we found a number of miscellaneous human bones. Other bones, perhaps from the same skeleton, were recovered in Room 16 and parts of two femurs in the fill of Room 15.

Despite the presence of these burials, shallowly covered with household rubbish and debris of reconstruction, families continued to occupy the rooms above. Practically all the artifacts we retrieved from this section of the ruin clearly had fallen from upper rooms. Excepting the intentional fill in Room 20, relatively little blown sand had collected in these ground-floor rooms prior to collapse of their ceilings. In only one room, 24, were evidences of burning conspicuous, and here fallen wall material and blown sand together measured 33 inches in depth before the conflagration left charred timbers and a blackened east wall. A layer of burned wood, building stones, and adobe flooring on the outer west side of Rooms 8 and 16 and about

2 feet above their floor levels is doubtless wreckage from the same conflagration.

Reference to the ground plan (fig. 2) will show that my consideration of this series of paired rooms as a unit has no real significance. A more logical grouping would have joined the three western pairs with the four rooms adjoining on the north, for all 10 are connected by doors and these doors are repeated not only in the second story but, where walls still stand, in the third story also. Presence of Kiva C prohibited north doorways in the first and second stories of Rooms 20 and 21.

Room 27, in construction at least, is representative of the best at Pueblo del Arroyo. It included three, probably four, stories and each superposed room, like that at ground level, connected with rooms adjoining on the east, west, and south. The north wall for each story was blank. We feel reasonably confident of a fourth tier because much of the third was still intact and the quantity of fallen masonry was such that it filled the basement room and came to door level in the second story. Many of the broken beams and ceiling-pole fragments in this debris had been charred to some extent but not enough to warrant belief that the place had been destroyed by fire.

After having been in use for an unknown length of time, both east and west first-story doors were carefully blocked. The first was sealed from Room 27 in such manner as to leave a recess on the Room 28 side; the second was closed from Room 26 to leave a 15-inch-deep recess in 27. Thereafter the only entrance to this room, excepting a possible hatchway of which we saw no evidence, was the south door leading to Room 23 and thence to 15 and 9. Each of these basement rooms was equally dark and poorly ventilated; no ray of sunlight ever pierced their enclosing walls. It seems unlikely that any one of the four was ever used for anything but storage.

Pueblo del Arroyo families lived in the second, third, and fourth stories. Here the stone walls were invariably plastered and, although it may have weathered from exposed surfaces, plaster is usually to be seen in corners even now. The outermost room in any unit was the living room, lightest of all. The occupying family, or families, in accord with deep-rooted Pueblo custom, doubtless folded their sleeping mats and blankets when not in use and stacked them at one side; their extra clothing, together with dried herbs and other foodstuffs, hung from suspended shelves in the inner rooms. Cooking utensils and jars of precious water were ranged along the walls, safe from careless feet. A hearth was usually present and mills for the grinding of maize.

While removing the constructional debris that completely filled the first story of Room 27 we came upon the following earthenware vessels:

	Plate	Figures
4 bowls	{ 22	<i>g-i</i>
	24	<i>c</i>
1 bird-shaped bowl.....	24	<i>h</i>
5 ladles and fragments.....	{ 26	<i>a</i>
	27	<i>b, f-h</i>
1 pitcher	28	<i>g</i>
	{ 30	<i>c-f</i>
6 ollas	31	<i>a</i>
	32	<i>b</i>
2 seed jars.....	29	<i>d-c</i>
1 small coiled jar.....	24	<i>i</i>
3 corrugated pots.....	33	<i>g-i</i>
2 bifurcated vessels.....	35	<i>a, b</i>
1 small seed jar.....	29	<i>b</i>

All were broken except the little bird-shaped bowl which was found close in the southwest corner. The jumble of building materials was so complete we could not separate it into its successive levels. Most of the broken vessels were recovered between 2 and 3 feet above the floor.

In addition to the pottery there were recovered from the Room 27 fill the double paint mortar seen in plate 41, *k*, a rectangular slate tablet (pl. 42, *j*), a stone disk $1\frac{5}{8}$ inches in diameter (U.S.N.M. No. 334807), a piece of turquoise squared for mosaic (No. 334741), an antler wedge fragment (No. 334934), and, left in the room, a sandstone tablet measuring 7 by 15 by $\frac{3}{4}$ inches, 11 cobblestones, 3 manos, 1 hammerstone, 6 small rubbing stones, 6 smoothing stones averaging 3 by 6 by $\frac{1}{2}$ inches, and 191 tabulated potsherds.

A glance at the illustrations will show the character of this earthenware assemblage. It is surprising to find only four bowls in the lot and each larger than the Pueblo Bonito average. Fragments of the two representations of bifurcated baskets and those of the threefold, redware ladle were recovered about 2 feet above the floor. None of these three items was designed for everyday use and yet their fragments were intermingled with those of water jars and corrugated pots.

The polished slate tablet (pl. 42, *j*) and the double paint mortar (pl. 41, *k*), the latter found intact in the southwest corner 3 feet above the floor, likewise may have been connected with activities not purely domestic. Paints were indispensable in the preparation of prayer sticks and altar paraphernalia, and red paint is still a necessity in completing the individual toilet, male or female. Our Zufii work-

men coveted every scrap of red ocher not wanted for the collections and forthwith made a rouge to brighten cheek or brow.

Our notes on excavation of Room 27 report, also, the finding of divers other artifacts: a sandstone disk $1\frac{5}{8}$ inches in diameter by $\frac{1}{8}$ inch thick (U.S.N.M. No. 334807), a bit of turquoise squared for inlay, the fragment of an antler wedge (No. 334934), 6 well-worked rectangular smoothing stones (average 6 by 3 by $\frac{1}{2}$ inches) and as many smaller ones, a crude hammerstone, 3 manos, part of a sandstone tablet measuring 15 by 7 by $\frac{3}{4}$ inches, and 11 rather large, waterworn cobbles. Most of these items were left in the room after completion of our examination.

Room 28 is a large room, almost 250 square feet in floor area. Its north and east walls are blank. South and west doors once gave access to adjoining rooms but the west door eventually was blocked from Room 27, leaving in Room 28 an 18-inch-deep recess, 26 inches wide by 44 inches high. Three large pine beams supported the ceiling and the floor of the room above. These were not strong enough, however, for occupants of the second story had propped each beam with a sturdy post.

The second-story east and north walls, fallen long ago, had been firmly bonded with those of the south and west. A possible third-story east wall, or, more likely a buttress, is suggested at the south-east corner where there had been union with the outer third-story masonry of Rooms 21 and 22. There was no corresponding union at the northwest corner. Hence, if Room 28 lacked a third story the inhabitants of 22C and 27C stepped out upon its flat roof and utilized it as an open-air living room.

Collapsing masonry had crashed down, filling Room 28 to a point above its second-story floor level, a total of 9 feet. In this fill we encountered a layer of charred wood sloping from ceiling height in the southwest corner to half that in the northeast quarter. Above that layer were several feet of broken stonework and blown sand. Below it and chiefly throughout the northern half of the room was a dump from which we recovered 18 hammerstones, 3 smoothing stones, 9 manos and parts of 8 others, a copper bell (U.S.N.M. No. 334763), part of an obsidian blade (pl. 40, *n*), and 8 restorable earthenware vessels, including:

	Plate	Figures
2 bowls	{ 22	<i>c</i>
	{ 23	<i>a</i>
1 pitcher	28	<i>j</i>
2 ollas	31	<i>d, c</i>
1 canteen	28	<i>d</i>



PLATE 2

Upper: Beginning excavations, outer south side of Pueblo del Arroyo. The second wheelbarrow is loading in Room 7. Jackson's "old arroyo" at left.
(Photograph by O. C. Havens, 1923.)

Lower: Rooms 1 to 7 after excavation. In the left foreground, the unnumbered room east of 7. Lighter areas in the original walls identify Expedition repairs.
(Photograph by O. C. Havens, 1925.)





PLATE 3

Upper: The unnumbered second-story room at the northeast corner of the south wing had been roofed and utilized for storage. Chicken yard at left.

(Photograph by Charles Martin, 1920.)

Lower: Northeast corner of the south wing, showing 1925 repairs. Salvaged stones for wall repair piled at left.

(Photographed by O. C. Havens, 1925.)



Room 32 adjoins 28 on the north and is almost exactly the same size. Its three east-west ceiling beams had also been propped in the middle by posts. In this case, however, the holes in which the posts were seated had been lined with pieces of sandstone slabs. Traces of adobe plaster persist on the north wall, not on the others. A north ventilator 4 feet 8 inches above the floor opens into Room 35 and a similar one in the second story, now blocked, formerly opened into 35B. We detected no positive indication of a third story.

The only known means of access to Room 32A was the door in its west wall. That door led into Room 31 and thence into 30 and 29. Either or all of these four rooms might have been provided with a ceiling hatchway but neither connects with the rooms adjoining on the north and south. The north and south walls of all four are doorless, a condition repeated in the second story and, where present, in the third also. Here was another isolated block of rooms!

There is a north-wall ventilator in 32A. North ventilators are to be seen, also, in 30B, 31B, and 32B, although the last named had been sealed. Room 29A has a west ventilator but none in the north wall.

The artifacts we recovered from the wreckage of Room 28 gave evidence of domestic activities pursued in the room or rooms above and this was equally true of our finds in 32. Here we unearthed 5 metates and parts of 4 others, 2 whole manos and 2 fragments, 2 smoothing stones, 6 hammers, a single small polishing stone, and a rather large piece of obsidian. We left all these in the room. One of the metates, measuring 21 by 16 inches, had a mano trough on each side. A number of lesser artifacts will be presented in chapter V but I cannot resist directing attention at this time to the broken obsidian blade illustrated as figure *n*, plate 40. The lower half of it was found in Room 32, the tip in 28, and no door connects the two.

Unlike those in the south wing, rooms of the central section evidence repeated alteration and revision of the basic plan. In none of the rooms heretofore described were subfloor walls disclosed by our testing, while in those next to be considered substitution and replacement occurred frequently. For example, the floor of Room 34 is 18 inches lower than that of 30, next on the south (fig. 6), and its three beams lay lengthwise of the room rather than across its shorter dimension. Kiva D was built in a former dwelling, thus blocking doors to Rooms 35, 39, and 40. Plastered walls identify Rooms 36 and 37 as living quarters occupying part of the site originally intended for a kiva.

Sometime after its east door was closed, Room 39A became a neighborhood dump. Approximately 4 feet of household waste and

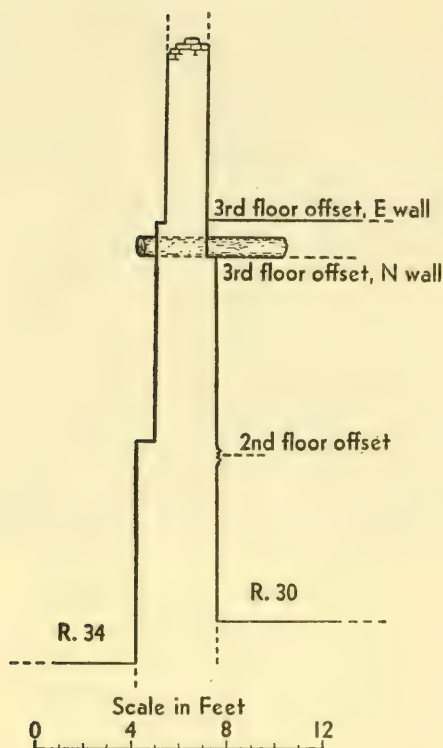


FIG. 6.—Profile showing difference in floor levels in adjoining Rooms 30 and 34.

height of 7 feet 4 inches carried 29 ceiling poles. The west ends of these poles instead of being tenoned in the masonry had rested upon the westernmost beam, seated close against the wall. Below the poles two anciently repaired areas suggest that the ceiling timbers of the room next on the west had been removed before construction of Kiva D. Both dressed and undressed blocks of sandstone went into the work of repair.

There were two clay-lined fireplaces in Room 40, one in the north-east corner and the other against the south wall. An irregular, clay-lined bin in the southeast corner, over 3 feet square and 10 inches deep, was filled with wood ashes. Between this feature and the north-east fireplace is a clay-lined hole, somewhat irregular but about 8 inches in diameter by 16 inches deep. Its size and depth suggest the seating of a former beam prop.

Room 40 ceased to function as a dwelling when a young man was

blown sand had collected here before the upper walls gave way. From this mixture of sand and sweepings we recovered a number of bone and stone implements, shell ornaments and fragments of ornaments, 2 tabular metates, 5 manos, 2 thin sandstone slabs with chipped edges, a discoidal stone 11 inches in diameter by 3 inches thick, pecked on one side but rough on the other, and 10 restorable earthenware vessels. In accord with my instructions, the larger stone implements were left in the room.

Room 40 is one of four adjoining dwellings on the site of a kiva that apparently was never completed. Room 40's smoke-stained walls had been plastered at least twice. Four large north-south beams at a

buried on the floor in the southwest corner. Thereafter all doors not previously blocked were sealed with coarse stonework. The body lay on its right side, face to the west, and legs flexed (pl. 12, A). Two pieces of split cedar a couple of feet long lay just beyond the head and longer slabs at the back, with irregular blocks of sandstone piled on top. The presence of these sandstone blocks is unusual, in our Chaco Canyon experience. A few casual spalls were under the body but the larger pieces had been placed to surround it, although haphazardly. As burial offerings a bowl and a pitcher had been placed beyond the head and outside the encircling stones. These two vessels may be seen to better advantage on plate 24, figures *d*, *e*.

Blown sand and debris of occupation had been carried in to complete the interment. In this debris, or covered by it, were 3 large tabular metates, 3 smoothing stones, a sandstone disk, 5 hammerstones, and 3,883 miscellaneous potsherds for analysis after all recognizable duplicates had been put aside. Alone on the floor in the northeast corner of the room was the occipital bone of an infant.

An earlier floor at a depth of 13 inches is that of a Chaco-type kiva that appears to have been abandoned even before it was well started. Our test trenches did not disclose the bench curve, but the end of a typical subfloor ventilator duct, 17 inches wide by 26 inches deep, masonry lined and clay floored, lies 26 inches from the middle of the south wall. A foot beyond is the accompanying fireplace, 20 inches in diameter, clay lined, and filled with ashes. I am sure I am correct in the recollection that every Chaco Canyon kiva we cleared, whether it represented the beginning of construction or abandonment after long use, had a fireplace filled with wood ash.

The ventilator duct of the razed kiva passes under the south wall of Room 40 at a point 8 feet 5 inches from its southwest corner, continues 4 feet 8 inches into Room 36, and then turns abruptly to the east. From the north wall to the abrupt angle the duct had been roofed with small poles overlain by thin sandstone slabs. Presumably, the kiva plans were discarded at this stage for, reduced to a width of 13 inches and a depth of 20, the unfinished duct was crossed by the east wall foundation and we discovered no extension of it in Room 37. Furthermore, four larger poles, each about 6 feet long, had been laid across the covered duct between the abrupt angle and the north wall as though to provide additional support for a sandstone-and-adobe pavement, 56 inches wide and 9 inches thick, that crosses Room 36 in a northwest-southeast direction and underlies its north, east, and west walls. The south edge of this "pavement" was left unfinished,

or had been razed, $4\frac{1}{2}$ feet from the east wall of the room and 2 feet 10 inches from the south.

A similar feature appeared in Room 40, immediately underlying the floor. In this case, however, the pavement, 5 inches thick instead of 9, and 5 feet 2 inches wide at the west, abuts the middle west-wall masonry above its foundation and extends thence eastward about 13 feet where it ends, somewhat irregularly, with a width of 4 feet 5 inches. Neither here nor in Room 36 did we locate the perimeter of the intended kiva nor did we discover the significance of the overlying "pavements."

Room 41, adjoining 40 on the east, had undergone repeated alteration. East and west across the middle of it is a series of demolished mealing bins, apparently 3 in number (pl. 11, A). Both the metates and the slabstones that once enclosed them had been removed by the former occupants. At the west end of the series a rectangular, slab-lined basin measuring 16 by 27 inches by 6 inches deep was identified by our Zuñi workmen as a receptacle for ground meal, while an oval, clay-lined, and ash-filled depression adjoining the easternmost bin was described as a place for live coals to provide warmth for those at the mills. Another clay-lined depression nearby, 18 inches in diameter, was ash free although reddened by fire.

There had once been a doorway through each of the four walls but, for some reason, each had been wholly or partially blocked. The original north door, 5 feet 8 inches from the northwest corner of the room, clearly was closed in consequence of the construction of Kiva J, for a substitute was soon provided. This latter has its sill 30 inches above the floor, a height that necessitated an assist of some sort. The sill is 14 inches deep and, from it, four built-in steps gave access to the court at the kiva roof level (fig. 7).

The first step rises 15 inches to an 11-inch tread; the second step has a 12-inch riser and a depth of $10\frac{1}{2}$ inches. At this level both jambs had been torn out and replaced with a new masonry facing that extends northward an additional 14 inches to enclose the third step. This latter has a 17-inch-high riser that slopes to the rear and reduces its tread to 9 inches. The fourth step, only 6 inches high, reached the Kiva J roof.

A second blocked north-wall opening measures 45 inches wide by 28 inches high with a sill 31 inches above the floor. The dimensions suggest a former cupboard or recess. Large, unworked pieces of sandstone had gone into the closing of it.

A curious and quite incomprehensible figure, composed of more or

less parallel lines with crosswise or lengthwise hatching, had been scratched into the wall plaster between the sealed recess and the stepped door. It is a less impressive example of Chaco Canyon art than the sandal figure on the north wall of Room 44 (pl. 14, B).

Room 41 had not long been vacated, if at all, when its ceiling collapsed. Some of the timbers were partially burned, especially those

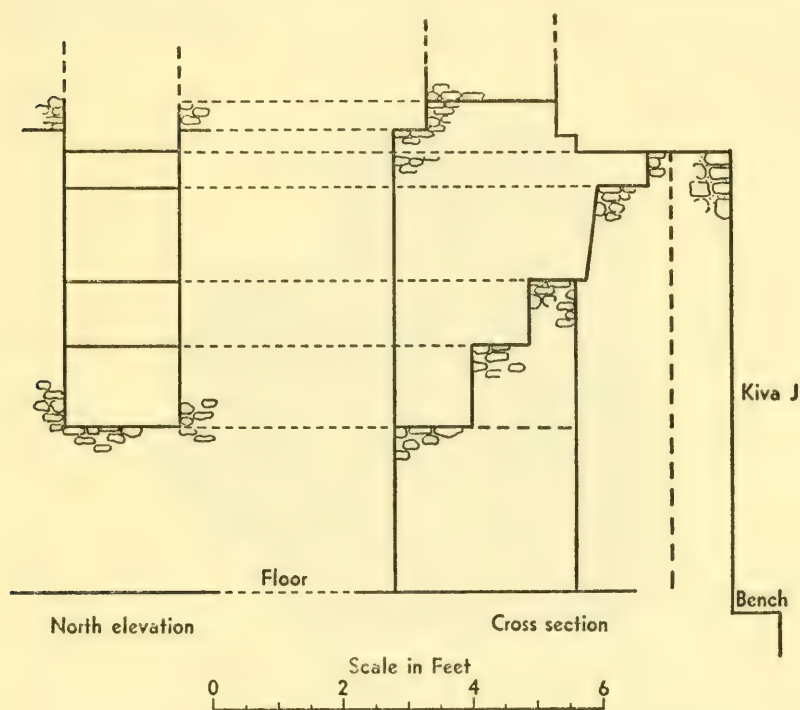


FIG. 7.—North-wall steps leading from Room 41, on the left, to roof of Kiva J.

in the northeast quarter, and among them blown sand had subsequently collected. Between and beneath the charred timbers we recovered a miscellany of artifacts, including 5 bone awls and part of a scraper made from the shoulder blade of, apparently, an elk, 2 arrowheads, a tubular bone bead, a stone ax (pl. 41, *d*), 7 stone jar covers, 3 small sandstone tablets at least one of which had been used in the manufacture of beads, a large turquoise pendant, burned and broken (fig. 8), 8 stone hammers, half a beaver's incisor (*Castor canadensis*) with a knifelike edge, and 2 large tabular metates each with its associated mano or hand stone. If the reader can mentally substitute

steel implements for those of bone and stone, this varied assortment is just what one might see in the living room of a present-day Pueblo home.

Room 43 lies between 44, a ground-floor dwelling, and two storerooms, 42 and 45. The four clearly comprised a family suite. We made no observations in the two storerooms, but someone, prior to Mindeleff's 1887 visit, had done a little prospecting here (pl. 15, *b*) and thrown the excavated material, including a single human femur, upon the accumulation in Room 43B.

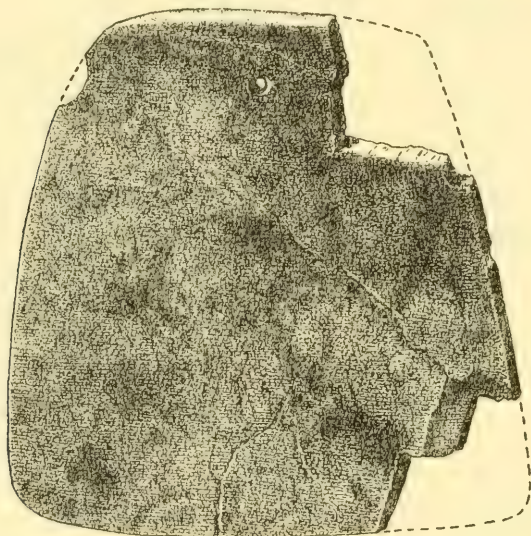


FIG. 8.—Turquoise pendant from Room 41.

Although Room 43 is not an unusually large room, two pairs of beams, 10 to 11 inches in diameter, were installed to carry the weight of its ceiling. But these proved insufficient. The south beam in the northern pair had to be braced at both ends and a 6-inch post was placed under the east end of the south beam in the other pair. Mud applied to the walls when the room was last plastered filled the angles behind these three posts and curved out on their sides.

A door connecting with Room 44 measures 4 feet 8 inches high, sill to lintel poles. Although the sill is only 17 inches above the floor, a height not at all out of the ordinary, it must have handicapped some elderly member of the household, for a block of sandstone had been embedded in the floor below to provide a 10-inch step (pl. 8, B).

West doors connect with the two storerooms, 42 and 45. Both doors had been equipped with a second set of lintels and secondary jambs having an outward batter for retention of doorslabs. Ruppert's sketch, reproduced as figure 9, leaves further description unnecessary. It is unusual to find, in the same wall, doors as unequal in size as these two.

Three feet of windblown sand, earth, and floor sweepings had gathered in Room 43 before its ceiling fell. From that accumulation we removed a number of bone awls and shell beads, numerous chips

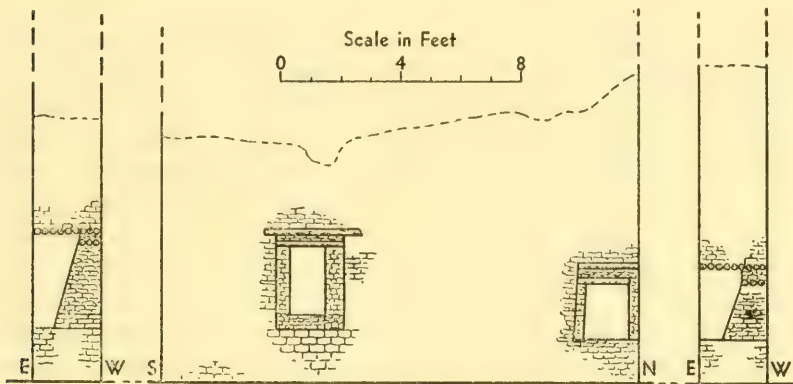


FIG. 9.—Doors connecting Room 43 with storerooms 42 and 45.

of flint, chert, and obsidian, pumpkin seeds and pinyon nuts, metate and mano fragments, a sandstone slab with white paint, and 11 hammerstones all but one of which were of either flint or silicified wood. Two metates as well as other utensils had fallen from the second story. Upon the sand and earth were the broken beams, poles, and juniper splints of the ceiling and, above them, shattered masonry from the upper walls. That the ceiling remained intact for some time after abandonment of the room is further established by the presence of several mouse and rat skeletons, and quantities of droppings, in the lower 8 inches of the fill.

Room 44 held our attention for several reasons: It was a first-story room that had been lived in and altered at least twice during occupancy; its ceiling was partly intact and a built-in stairway led to the roof level of Kiva F. Finally, neighbors had dumped in a lot of household trash, and trash piles are often archeologically rewarding.

The ceiling was of customary local construction: First, two great pine logs laid east-west, then pine poles, juniper splints, bark, and

adobe mud. In this case, however, a thin layer of adobe was spread directly upon the splints; next came the bark and, upon that, more adobe mud. Although the second-story east wall had fallen and broken through, much of the second-story floor remained intact. Sometime after its completion, however, four of its secondary supporting poles had been cut off to allow for a small hatchway, 12 by 17 inches, in the southeast corner. The opening was not a complete success, however, for it had subsequently been closed with a couple of sticks and a layer of reeds and then sealed by three successive floor surfaces, each from $\frac{1}{2}$ to $\frac{3}{4}$ inch thick.

Reconstruction in the ground-floor room was evidenced by the fact that the two main beams, each $11\frac{1}{2}$ inches in diameter, were only 5 feet 2 inches above the floor. Despite their size, both beams had required bracing to help support the weight they carried. The south beam, now with a fairly fresh-looking crack, was propped at the east end only while its companion had been braced at both ends by 8-inch posts set close against the walls. At least one of these posts stands upon a sandstone slab 4 feet 4 inches below the floor or $9\frac{1}{2}$ feet beneath the beams. Since finished masonry of the south wall continues to a point 9 feet 3 inches below the beams, there to rest upon a single course of foundation stones, it seems likely the three props were installed at the time of, or shortly following, initial construction of the room.

The latest pavement in Room 44 was only 5 feet 2 inches below the principal beams but test holes revealed earlier floors at depths of 17 and $32\frac{1}{2}$ inches. If any architectural features are associated with the lowermost floor they were not disclosed by our limited testing to that depth. For reasons not immediately apparent, that lower floor had been abandoned, and windblown sand and waste from the village dump had been carried in and spread upon it. Then the fill itself was covered by a layer of adobe mud, creating a new surface $15\frac{1}{2}$ inches above the older at the west side of the room and 2 inches higher at the east side.

On this second floor, which is somewhat uneven, exploratory trenches discovered a built-in stairway, a circular, slab-lined fireplace, and two puzzling fixtures: a masonry "bin" in the southeast corner and a neatly walled trench under the north side of the room. The bin, finished on the outside only, is 44 inches square by 17 inches high. It had been filled with sand and debris of reconstruction (among which we found three discarded hammerstones, fragments of three dressed sandstone slabs, and miscellaneous late potsherds) and eventually was concealed by the third and final floor.

The second fixture, a "trench" of small-stone masonry with concave end and sides 18 inches apart, underlying the north wall 5 feet 4 inches from its northwest corner, seems less puzzling in retrospect than at the time we exposed it. The concave end is only 10 inches from the north wall, but north-wall masonry extends down between the sides of the structure for a like distance while the sides themselves continue an additional 12 inches, a total of 22, to a point $6\frac{1}{2}$ inches below the earlier floor, that at a depth of $32\frac{1}{2}$ inches.

This "trench" can only be the end of the subfloor ventilator tunnel connected with the partially razed kiva beneath Room 47B. If my surmise is correct, the vertical shaft that formerly stood upon the tunnel end was razed and both the present north wall of Room 44 and the subfloor at a depth of 17 inches were introduced at the same time. Therefore, the lower floor, that at $32\frac{1}{2}$ inches, is probably the original, and the original north wall of 44 was probably torn out when the kiva was built in 47A. Similarly, a 3-inch-deep concavity in the middle of the east wall must mark a former door, closed and plastered over when Kiva F was built.

Intrusion of Kiva F into the house group fronting Room 44 not only blocked the former east door but prompted the opening of a substitute. This substitute, 32 inches north of the old one, is 26 inches wide and 35 inches high; its lintels are on a level with the ceiling poles and its sill is 4 feet 2 inches above the contemporary floor. To enter and leave by this elevated door, four steps were provided. They are part of a block of solid masonry, 47 inches wide and extending out into the room 52 inches (pl. 9, A). This masonry block abuts an earlier coat of plaster on the north and east walls. The four steps, repeatedly resurfaced, led to the doorsill 50 inches above the floor; thence, five more steps continued through the door and a 28-inch-long passageway to the roof level of Kiva F. That passageway, of masonry finished on the inside only, is the same width as the door, 26 inches, and abuts the outer east wall of Room 44.

The jambs of this elevated door are 27 inches wide, and the decayed remains of their associated lintel poles lie 35 inches above the doorsill. We could trace these remains only 15 inches, the outer face of the wall having fallen. Since two 8-inch-high steps were built within the door we assume the missing lintels were raised 8 to 12 inches above their fellows to allow an equal headway.

A glance at Ruppert's drawing of this door (fig. 10) and the flight of steps leading to and through it shows that the architects of Pueblo del Arroyo were not bound by inflexible rules. To them a stairway

was not so much an expression of their art as a means toward an end. It mattered little that the 10 steps varied in height from 6 to 15 inches and in depth from 11 to 14. An average for the 10 risers is 8.5 inches; for the 9 treads, 11.8 inches.

After this stairway had served its purpose for a time, some circumstance brought about further alterations. Debris from the village dump was again carried in and spread throughout the room in a layer varying from 15 inches at the foot of the stairway, the height of the

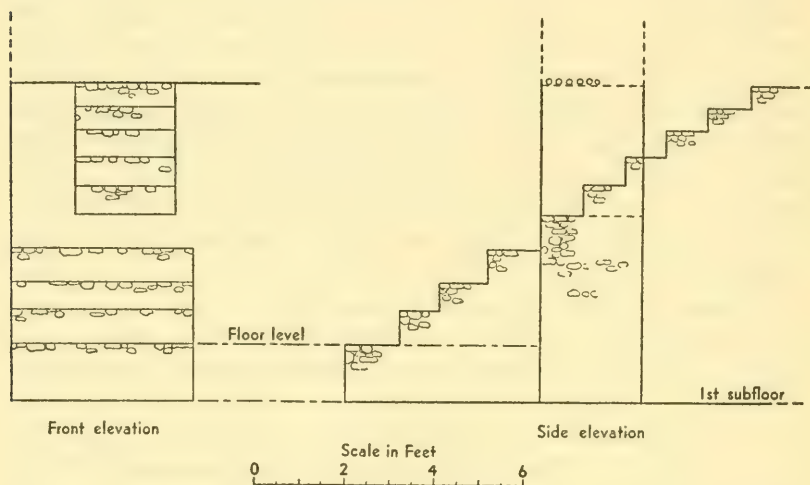


FIG. 10.—Built-in stairway leading from Room 44, on the left, to roof of Kiva F.

bottom step, to 17 inches against the west wall. Then a new floor was laid upon the debris, covering the masonry-walled bin in the south-east corner and rounding off with a fresh coat of wall plaster.

But this third and final floor forced alterations at the west door. Here the original floor was $18\frac{1}{2}$ inches below the doorsill; the second floor reduced that height to 3 inches, a fact that offered no obstacle to passage. However, when 17 inches of waste was brought in and a third floor laid, remodeling of the door was unavoidable. The change was made from Room 43 by raising the doorsill 14 inches but leaving 10 inches of the old one bare on the opposite side. The final floor in Room 44, therefore, is on a level with the remodeled sill of the west door.

Despite its lowered ceiling, Room 44 was still habitable. Elimination of the southeast corner bin allowed more space, but the middle of the floor was again occupied by a fireplace, this one nearly square

instead of circular and lined with sandstone slabs that stood up unevenly a couple of inches. In the north wall at the convenient height of 47 inches, a small recess was provided, a neatly plastered repository whose lower corners are rounded while those above are squared. Five inches east of this pocket is the figure of a sandal, drawn by some former resident upon the brown plaster with a bit of kaolin (pl. 14, B).

A hole torn through the south wall is of recent origin, as evidenced by marks of a steel pick upon the stones. Nearby, the name "C. F. Jones" carved in the adobe plaster may identify the wielder of that pick. As double insurance against oblivion the name was repeated on the west end of the south beam, together with the indistinct date, 18—. To save the north beam at least temporarily we sawed off its decayed east end and propped the remainder with an 8-inch post at the outer corner of the stairway.

Eventually the occupants of Room 44A moved out and their home became a dumping place for neighborhood rubbish. From this we salvaged a number of discarded artifacts, some of which are illustrated hereinafter, and several restorable pieces of pottery. Among these latter none is more intriguing to an archeologist of the southwestern United States than the bowl illustrated in plate 25. It is a brown bowl with polished black interior ornamented with a linear design in matte paint and is more fully described in chapter VI.

Another interesting find from Room 44 is the incomplete skeleton of a macaw, one of those gorgeous red-blue-and-yellow parrots (*Ara macao*) from tropical Mexico and south. The skeleton is especially interesting to me because the sternal apparatus had been fractured by a blow and subsequently healed. Presumably the bird had bitten a careless finger somewhere on the long trail to Chaco Canyon, or after arrival there, and had been felled by a stick in angry hands with the result more fully described on page 127.

Foodstuffs represented among the household rubbish include deer and antelope bones, pumpkin rind, stems, and seeds (*C. pepo*), pinyon nuts, shells of the canyon walnut (*Juglans major*), seeds of prickly pear (*Opuntia* sp.) and, most surprising of all, seven scales of the Rio Grande gar (*Lepisosteus tristoechus*?; U.S.N.M. No. 334958).

In the second-story room, 44B, plaster still adhered to all four walls when we bared them. At least three of the four doors originally provided for 44B had later been blocked, including one of T shape overlooking Kiva D.

Room 46 is of interest chiefly in connection with its neighbor, 47.

As represented on figure 2, both are portions of former structures partially razed to satisfy ceremonial requirements. The original Room 47 was commandeered first and a kiva was built inside it. Eventually this ceremonial chamber was replaced by Kiva E.

Room 46 likewise was appropriated, although only the north half of it was actually required. Since the remainder of this former house was thus rendered useless for all practical purposes it was abandoned and half filled with debris of demolition. However, a section of ceiling at the south end was left in place. The beam supporting it, 10 inches in diameter, lies 8 feet 1 inch above its contemporary floor, and each end is propped by a post close against the wall. We dug down and found the base of the western post resting upon a sandstone slab $4\frac{1}{2}$ inches below the floor. The reuse of salvaged timbers is proved once more by the fact that this original south beam is dated A. D. 1070 while the post bracing it was felled 18 years earlier.

Sometime later, as though to utilize that ceiling remnant, a new north wall was built in upon the fill together with an accompanying floor 3 feet 8 inches below the old ceiling poles. Five of these latter were tenoned in the new wall but the other eight were cut off a few inches short. The space beneath, low and cramped as it must have been, was suitable only for storage and this is the purpose to which it had been put. We noted many pumpkin seeds and pinyon nuts on the floor and, at the west end, a pile of soft white sandstone of the sort sometimes used to whiten wall plaster. Access to this improvised storage place was by means of a 19-by-22-inch hatchway 2 feet from the southeast corner. This feature obviously belonged to the original room since the lone ceiling pole supporting its north edge, while tenoned into the new north wall, had been severed 2 feet from the south.

The new north wall not only abutted the upper 4 feet of the plastered first-story masonry but rose to block two doors in the second story, 46B. One of these two was T-shaped and had formerly opened into Room 47B, next on the east. In figure 2, therefore, the indicated north wall of Room 46 is really at the second-story level and so, too, is that of Room 47.

Room 47 had been subjected to earlier and even more extensive alterations than its neighbor. Its smoke-blackened walls testify to occupancy as a dwelling and the presence of an open hearth. After an unknown interval the room had been preempted by some priestly group that wished to erect a kiva on the site. The kiva was built and then it, in turn, had been abandoned and partially razed. What re-

mained was filled with the debris of demolition and other waste; a new floor was spread upon that fill, and a new north wall was built in to complete a remodeled, second-story house. It is this later, second-story wall that is represented on our ground plan of Pueblo del Arroyo (fig. 2).

We found the remodeled, second-story room an intriguing one. In the first place, its north wall, which still stands to a height of $4\frac{1}{2}$ feet, was erected upon a shallow foundation that rests directly upon the first-story fill. Secondly, that wall abuts from both sides the plastered remnant of a former north-south wall, 25 inches thick, that had stood upon paired 9-inch beams at second-story floor level and thus formed two narrow but unequal compartments in the space we are describing as Room 47B. The western compartment measured 44 inches wide at the north end; the eastern, 5 feet 8 inches.

Masonry walls built upon paired beams bridging a room below were no novelty at Pueblo del Arroyo but, in the present instance, it is clear that the original north-end support of the two logs had been withdrawn, for here the pair had settled 10 inches under the weight of the masonry they formerly carried. It was this settling, no doubt, that brought about removal of their masonry wall and union of the space on either side. The beams were left in place but the wall was entirely razed except a veneering at each side of the paired beams and a plastered remnant abutted by the built-in north wall. The near end of this remnant, broken in line with abutting stonework on either side, had been muddled over when the north wall was last plastered.

Instead of hiding the paired logs under an all-over floor, the builders adzed down their upper surfaces and covered their sunken north ends with a single layer of 1-inch slab fragments and a coating of adobe mud. Although the intervening portion had been flattened on top, the ends of the pair as embedded in the north and south walls retain their full circumference. At the south, where no evidence of reconstruction is to be seen, the pair rests upon the second-story floor offset and extends through the masonry to terminate, square cut and abraded, flush with the face of the north wall in Room 44B.

The two beams and the veneering at their sides remained as a minor obstacle in reconstructed Room 47B, for the rebuilt floor, spread upon the debris fill of the room beneath, was at two levels. That east of the two logs lay 5 inches below the second-story floor offset, and the western portion about 3 inches lower. Here the built-in north wall abuts a blocked T-shaped door that once gave access to

Room 46B. In the corner below this blocked door is a masonry-lined bin, unburned but ash filled (fig. 11).

In the larger, east half of the room blocked east and south doors are to be seen, the latter only 5 inches from the one-time partition. Below it is a 9-inch-deep fireplace, its east and west sides of slabs and its north side of clay, with two burned sandstone firedogs lying on the bottom (pl. 9, B). A second rectangular fireplace abuts the

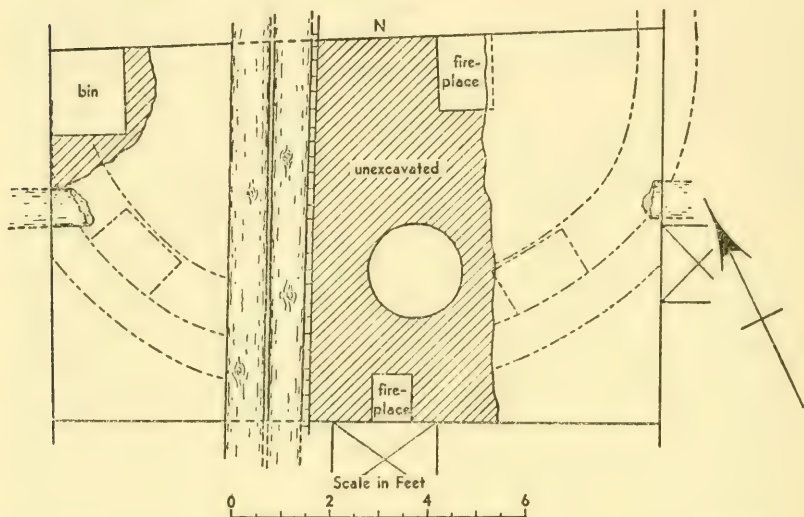


FIG. 11.—Floor plan of Room 47B with south arc of raised kiva built in 47A.

middle of the north wall and between it and the first one is a circular depression, 2 feet in diameter and 5 inches deep, clay lined and ash filled. There were no other fixtures in the rebuilt, second-story room, but fires lighted on the open floor had burned through the adobe in a couple of places to scorch the paired beams of the old partition.

Beneath the divided floor was a purposeful fill consisting mostly of constructional waste from razed walls. We put down two test pits, one on either side of the paired logs, to learn what lay concealed. Although somewhat handicapped for working space by the architectural features already described, our pits reached the floor of the first-story room and disclosed an interesting sequence in utilization.

Room 47A was rectangular, as are most rooms in Pueblo del Arroyo, and it had been long occupied as a dwelling, for its walls were not only plastered but thickly smoke stained. Such use was interrupted, however, when the room was appropriated and a circular kiva,

or ceremonial chamber, built within its four walls. Because the north wall of 47B stands upon a loose fill we made no search for the northern ceiling beam of the original lower room, but that at the south, a magnificent timber 12 inches in diameter, had been chopped off with stone axes, leaving both ends embedded in the masonry. The west stub, which gave us a tree-ring date of A. D. 1066, projects 9 inches from the wall, and a former supporting post still stands beneath it. One of the paired beams in the rebuilt second-story room was felled 11 years later, a fact that only adds to the tangled history of this section of the ruin.

Ceremonial chambers in Chaco Canyon were traditionally cylindrical, their domed ceilings of cribbed logs resting on 6 or 8 pilasters equally spaced upon an encircling bench. Hence, when priestly builders set out to construct a cylindrical kiva within the narrow confines of rectangular Room 47A they were forced to compromise between ingrained custom and solid stonework. At the south end of the former dwelling the kiva masonry still stands 9 feet high, to within 14 inches of the second-story floor offset. Its concave face curves evenly to the west, half encompassing the post left standing under the beam end, and then merges with the straight west side of the one-time residence.

A greater obstacle intervened on the east side. Here, to realize the diameter previously decided upon, the kiva builders tore out just enough of the old wall facing to allow for construction of the domed ceiling—a section concave both laterally and vertically and with maximum depth of 8 inches at bench level. To support the undisturbed masonry above this concavity three lintel-like poles were laid in horizontally 49 inches above the bench and their ends embedded in the kiva stonework. To tie this new stonework to the older, three lesser poles were inserted at right angles to the kiva wall, their outer ends flush with its concave face.

Our test pits disclosed a bench, 15 inches wide by $24\frac{1}{2}$ inches high, and two masonry pilasters thickly plastered and smoke stained. One pilaster measured 14 inches long; the other, 12. They averaged 20 inches wide by 20 inches high, and each supported four 3-inch poles, side by side, instead of the single pilaster log we expected to find. The four poles rested on top of the stonework with a thick pad of mud above. We removed two and found them to be 29 and 30 inches long, respectively, all embedded in the wall masonry except the portion full length of the pilasters.

In the adobe mud above one set of pilaster poles we noted the imprint of a horizontal log, clearly a lower member of the cribbed

ceiling. We noted, also, that the wall facing for a couple of feet above each pilaster had been dislodged—evidence that the ceiling logs had been wrenched free for use elsewhere. A south bench recess between the two pilasters may be presumed. That which was previously described as a “masonry-lined trench” extending from under the north wall into Room 44 is undoubtedly part of the ventilating system of this Room 47A kiva.

When this ceremonial chamber had served its purpose, the north half of it and the north wall of the one-time dwelling in which it stood were both removed to provide space for a larger kiva. This latter and its relation to the whole will be described as I discuss the sequence of events leading up to construction of Kiva E.

Room 51 was a two-story house occupied, both upstairs and down, as living quarters. Two east-west beams had spanned the lower room at a height of 8 feet 3 inches; the ceiling-pole level lay at 9 feet 1 inch and the second-story floor offset, 10 inches higher. All four walls had been plastered and the corners tied. A ceiling of customary local composition is suggested by split-cedar strips in the wreckage.

Several features in these two rooms deserve fuller consideration than is possible in Appendixes B and C. First, a rectangular fireplace sunk into the floor in the middle east half of 51A, lined and paved with sandstone slabs, is unusual in that it has attached to the west side of it a semicircular, shelflike appendage 5 inches from front to back and 5 inches above the bottom of the hearth. Its concave side was lined with mud rather than slab fragments.

Ventilators do not regularly occur in the ground-floor rooms of Pueblo del Arroyo, but a 12-by-15-inch recess on the west side of 51A may have been such a one although only 40 inches above the floor. The opening had been blocked from Room 50 which remains unexcavated. An indubitable former ventilator on the east side of 51A, 7 feet 5 inches from its southeast corner, is noteworthy in that it once opened into Room 52B as well as 52A. We judge it to have been 15 inches wide by 17½ inches high—rather on the large side; its sill slab lay 8 feet 2 inches above the floor and its wooden lintels a few inches above the ceiling poles of 51A, or approximately at floor level of 52B. Both because the facing masonry hereabout had fallen and because the one-time opening had been closed when Room 52A was abandoned and filled, our examination was not conclusive. Nevertheless I believe this to have been a local example of the oblique ventilator we disclosed in Pueblo Bonito and which Mindeleff (1891, p. 207) described as a recurrent feature of old Zuñi architecture.



A. Slabs embedded in the floor of Room 8B-I and rimmed with mud provided a shallow basin. The leaning door slab, slightly used as a metate, was found elsewhere in the room.



B. A built-in partition separated Rooms 8B-I and 8B-II (at left). In left foreground, hole broken through into first-floor room.

(Photographs by O. C. Havens, 1923.)

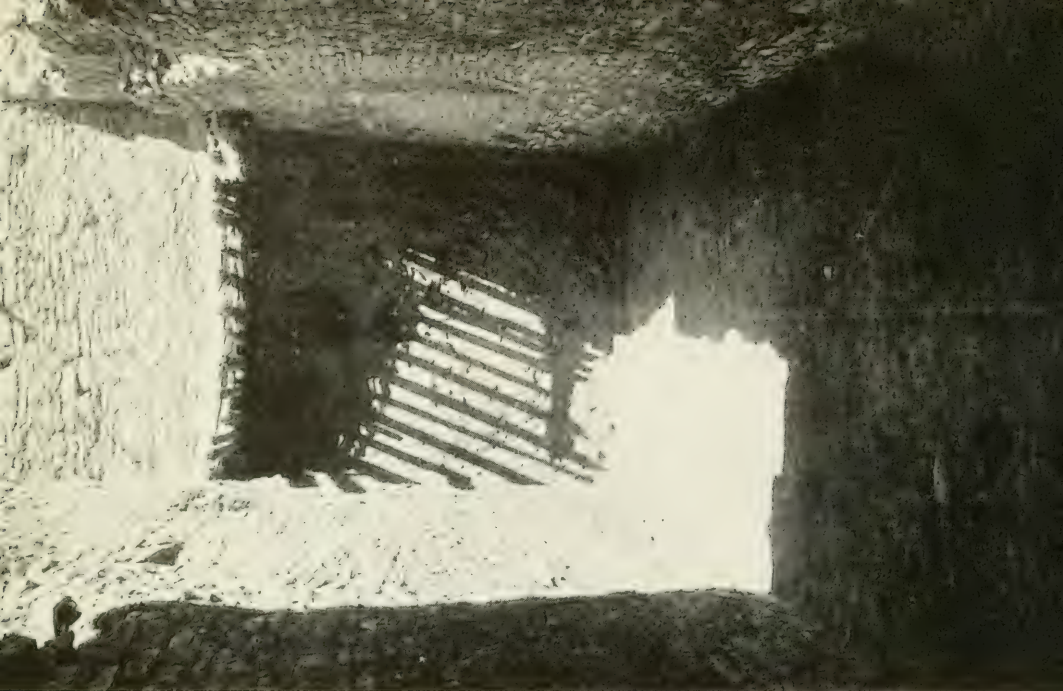
PLATE 5

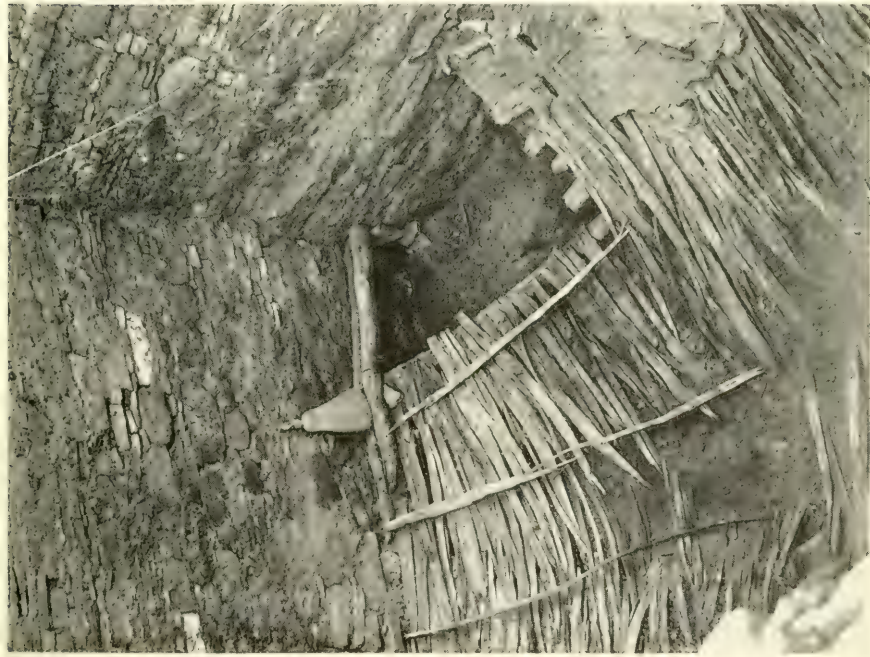
Left: Room oA from the east. In upper middle, above the ends of decayed ceiling beams, a new partition on steel-ax-hewn logs separates Rooms oB-I and oB-II. At far end, the repaired door to Room 8A and part of the original oA ceiling under oB-III.

(Photograph by O. C. Havens, 1925.)

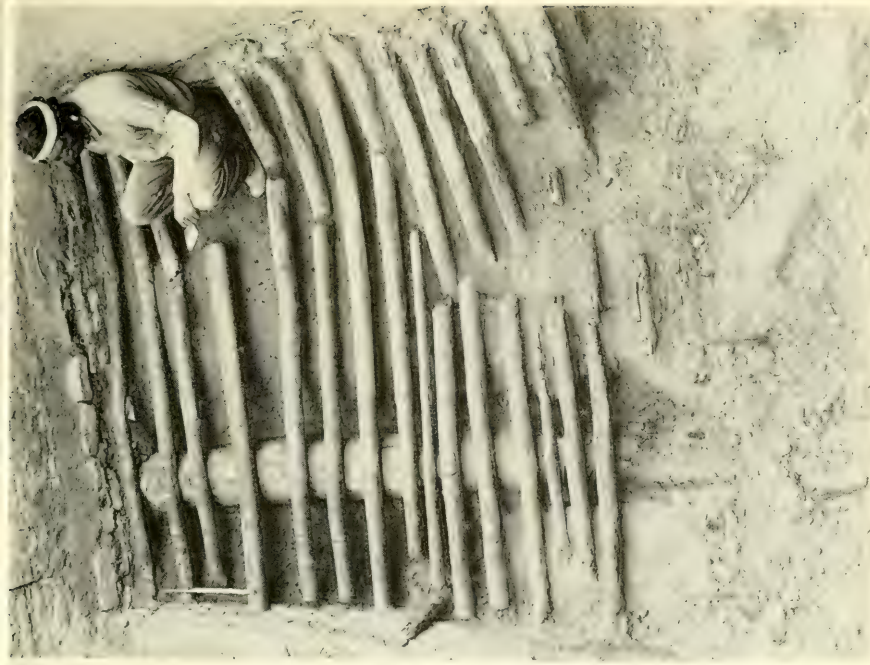
Right: Room oA was filled with blown sand and debris of occupation. Above the fill, decayed beams and a ceiling remnant support the east wall of Room oB-I. View from the west.

(Photograph by O. C. Havens, 1923.)

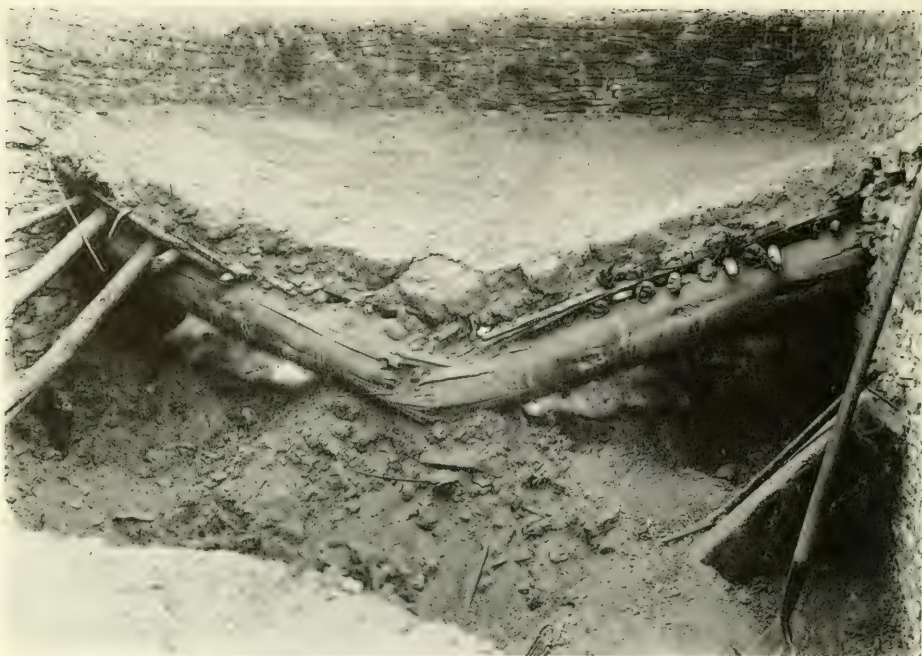




A. Hatchway in southeast corner of Room 20B.
(Photograph by O. C. Havens, 1923.)



B. Beam and cross poles under the floor of Room 46B. The
workman squats in the southeast corner hatchway.
(Photograph by O. C. Havens, 1925.)



A. The west wall of Room 16B had fallen, crashing through the floor and into the room below.

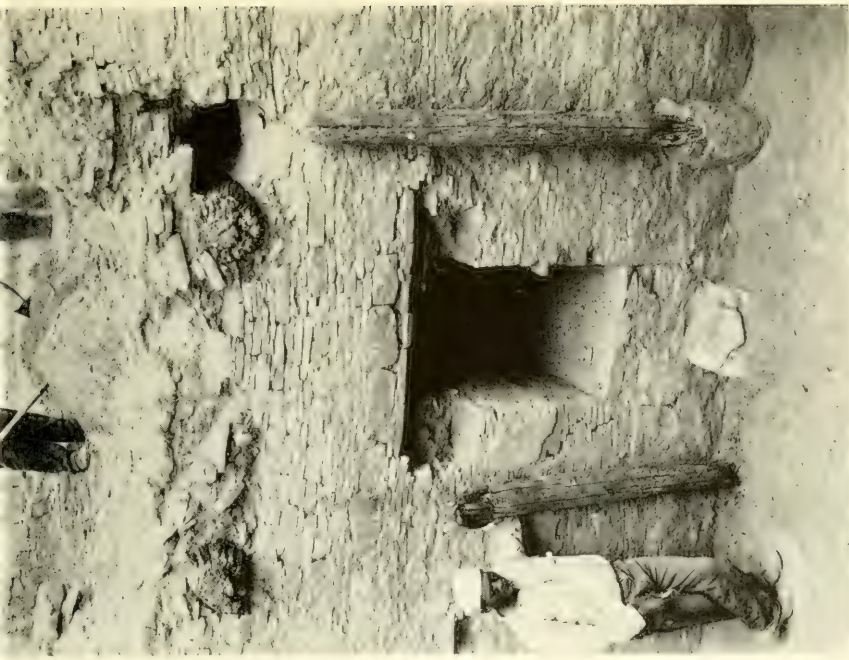


B. Part of a willow screen under the broken ceiling of Room 16A.
(Photographs by O. C. Havens, 1923.)



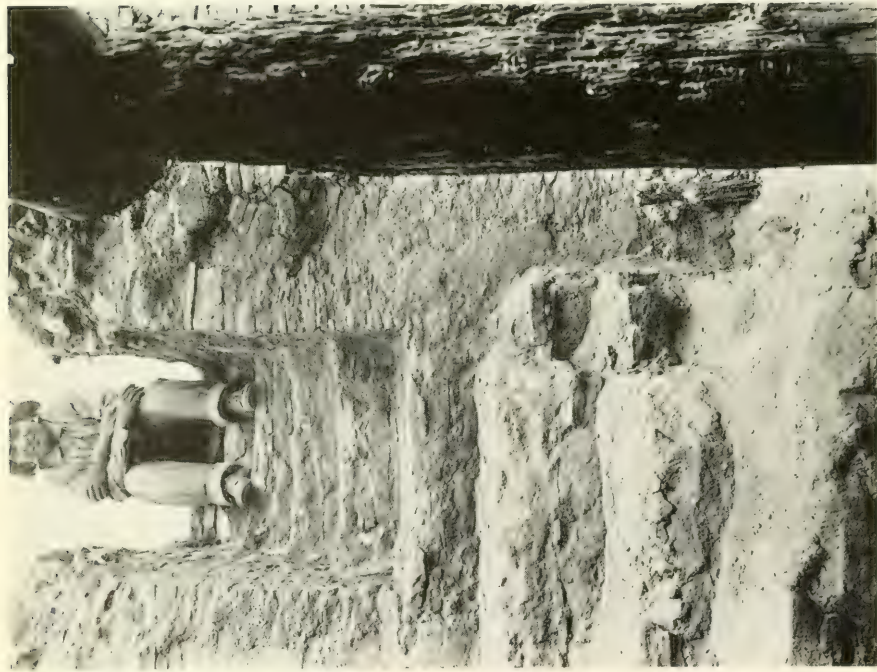
A. The broken ceiling of Room 16A and the squared timber that presumably had braced it.

(Photograph by O. C. Havens, 1923.)



B. Partially blocked east door in Room 43A with slab step and, at either side, props for ceiling beams.

(Photograph by O. C. Havens, 1925.)



A. Stairway from Room 44A to roof of Kiva F. At right, post bracing a ceiling beam.



B. Fireplaces in Room 47B and, at right, paired logs that had supported a former second-story partition.

(Photographs by O. C. Havens, 1925.)



PLATE 10

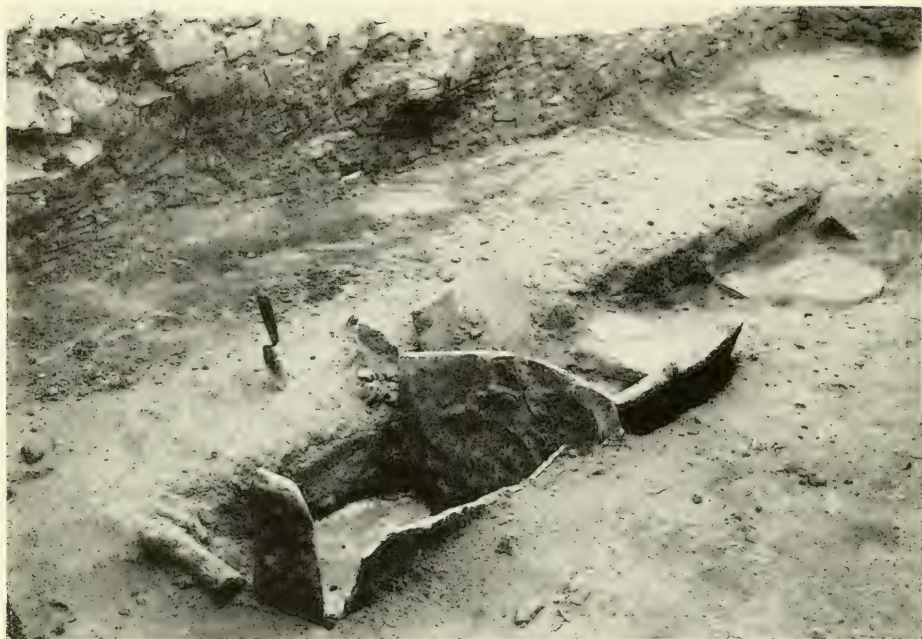
Upper: Supporting posts built into the south wall of Room 52.

(Photograph by O. C. Havens, 1925.)

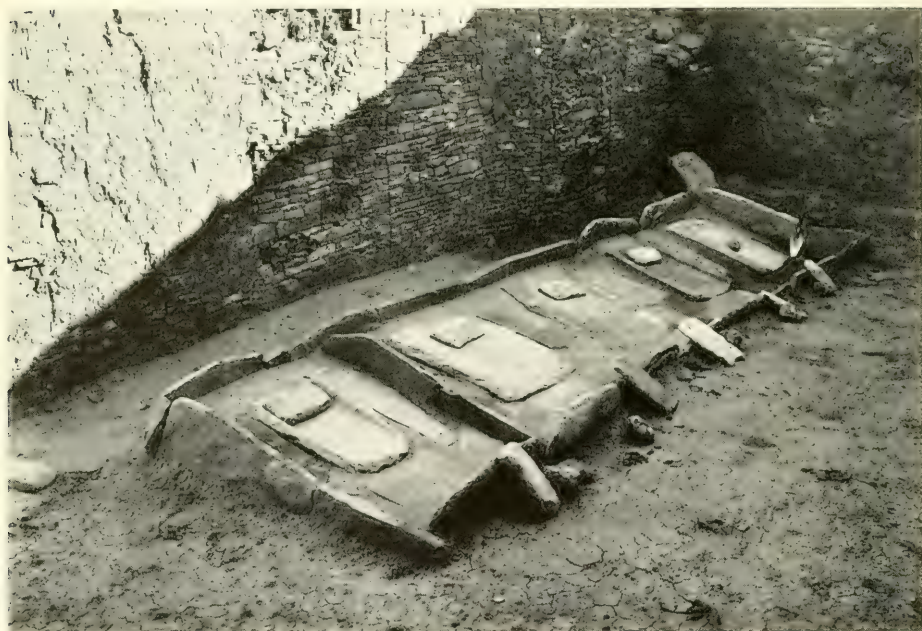
Lower: Ceiling poles roofing the northeast corner of the Kiva C square. At midleft, refilled Room 63 and south face of the north wing.

(Photograph by Neil M. Judd, 1926.)





A. Dismantled mealing bins in Room 41.



B. Blocked east doors and reconstructed mealing bins in Room 55.
(Photographs by O. C. Havens, 1925.)

Doorways connected 51A with rooms adjoining on the north and west. In both cases the lintel poles had decayed and brought about collapse of the overlying masonry—damage we repaired as excavations progressed. A former east door, 28 inches wide by $4\frac{1}{2}$ feet high, 6 feet 8 inches from the southeast corner of the room and $16\frac{1}{2}$ inches above the floor, had been blocked and converted into a recess at a height of 44 inches when Room 52A was filled.

A substitute for this latter doorway was provided in the form of a narrow, vertical passage that gave access to the adjoining, second-story room, 52B (pl. 13, B). Since the sill of this substitute is 30 inches above the floor, a step was necessary—in this instance a 10-inch-high masonry platform built against the plastered east wall. Measured on its sill, the passageway is 26 inches wide and 23 inches deep (6 inches less than the thickness of the wall); part of its 11 lintels were in line with the ceiling poles of 51A, 9 feet 1 inch above the floor, but those on the opposite side are 6 inches higher and at floor level of Room 52B. This 6-inch difference in elevation clearly was intended to facilitate use of the passageway. As a further aid a recessed landing, 23 inches wide by 21 inches deep, was provided 4 feet 8 inches above the doorsill or approximately 27 inches below the floor of 52B. One would expect to find protruding stones or built-in wooden steps between sill and landing but we observed none.

The coarser stonework within this narrow passageway and on either side of it at landing level is in marked contrast to that of the original wall and reflects haste or carelessness when alterations were made, presumably in conjunction with the filling of Room 52A. In time this inferior masonry bulged and buckled; the upper south wall, lacking renewed corner ties, settled outwardly and thus explains why the near jamb of the door is $18\frac{1}{2}$ inches from the corner at the top but only 10 inches at the bottom.

That portion of the second-story east wall which had not previously fallen collapsed during our excavation of Room 51A. Before this, however, we had noted several constructional features that must be recorded. On the east side, 23 inches above the second-story floor offset and flush with the south wall, was part of a plastered recess or cupboard, 16 inches wide, 10 inches deep, and 18 inches high. Its north side had fallen, but lintel-pole sockets survived in the opposite jamb. Twenty-one inches north of this recess a rather crudely finished corner was to be seen, still 57 inches high. We guessed it to be the south jamb of a second-story door provided at the time this wall was rebuilt.

In the northwest corner of 51A an 18-inch-high section of masonry remained above the second-story floor offset. Embedded in this section were the ends of two parallel logs that, apparently, had once spanned Room 53A to support a partition between 50B and 53B. The two ends, unevenly decayed instead of being square-cut and abraded, continued half a foot beyond the corner and thus into the north wall of 51B. Here, resting directly upon the beam ends, was a horseshoe-shaped piece of stonework, 10 inches high and 14 inches across, open end to the east. Part of a sandstone metate, trough down, covered the south log end and the whole assemblage had been concealed in the masonry where the four second-story rooms met. I surmise that this unique feature was a repository for prayer plumes or other offerings placed there at the time of construction.

That the occupants of Room 51A eventually wearied of their remodeled home and moved elsewhere and that the neighbors promptly appropriated it as a convenient dumping place is evident from the quantities of household rubbish we removed. Among the debris were numbers of broken or discarded artifacts including three large trough metates one of which measured 25 by 12 by 8 inches and had two mano grooves. In addition there were parts of two large, thin metates of the type we ascribe to the Pueblo II culture; 30 manos, 5 of them but little used; fragments of four flat, polished lap stones; a large stone ax, its blade broken; 50 outworn hammerstones; two discoidal sandstone jar covers, and other objects. We left most of these in the room, but a number of items retained for the national collections will be described in the pages to follow. We should note, also, the skull of a mountain sheep (*Ovis canadensis*), broken for extraction of the brain, and the butt end of a war club made from the antler of an elk (*Cervus canadensis*). Only four restorable earthenware vessels were recovered from the debris, but one of these (pl. 31, c) is the largest found during our Chaco Canyon explorations.

Room 52B is a second-story house whose east wall has fallen to within 20 inches of its associated floor and whose south wall, of rather crude construction and heavily plastered, is braced by 4 recessed posts. These posts average 5 inches in diameter and stand 11½ inches, 47 inches, 7 feet 5 inches, and 11 feet, respectively, from the southeast corner (pl. 10, upper). The first one is based upon a sandstone slab 20 inches below the floor. We did not disturb the other three. Clearly this wall is of secondary construction and for the second story only since, with a 4-inch-wide offset 9 inches below the floor, it rests upon a roughly built, 5-foot-high foundation that abuts both the east and west sides of the first-story room.

In the middle of the east wall, 8 inches above the floor, is the sill of a door that had been closed with masonry. Seven inches in front of that door a block of red cedar, 7 by 12 by 29 inches, stands half embedded in the floor. A test pit to discover the significance of that block revealed only that it stands upon the lower of two east-wall offsets, 8 inches wide and 14 inches below the floor. It is my guess that the cedar block was placed there to serve as a 15-inch-high step to the east door after a new sill had been installed more than a foot above the old one.

A lesser offset, 5 inches wide, lies at floor level and ends, in line with the lower, $6\frac{1}{2}$ feet from the southeast corner. At this point the east-wall foundation abuts a 16-inch-wide wall, its top at the level of the lower offset, that continues across the room in a southwesterly direction. Now only a foot high, this wall rests upon a loose fill of sandstone spalls and adobe, but 25 inches lower and a foot to the south is the concave face of a partially razed kiva, some of its plaster still adhering. We followed this latter to a depth of 7 feet 9 inches and since it is of Type III masonry and apparently without a bench, I judge it to be part of the unfinished ceremonial chamber we found under the northeast quarter of Kiva E—this despite the fact that the two arcs, as exposed in our narrow trenches, do not coincide. I suspect a slight error in our bearings on that under Room 52B.

Room 55 likewise exhibits a number of alterations that reflect external pressures. Successive doors connecting with the residence next on the east had been sealed before, or coincident with, appropriation of that house as a site for Kiva H. Nevertheless, Room 55 apparently continued in use, as a meal room if nothing more. Its walls had been plastered twice and on the second coat some artistically minded member of the family had drawn with white kaolin three outlines of the left hand and two crude human figures. During our examination of Pueblo del Arroyo we observed only two other instances of casual wall decoration, in Rooms 41 and 44. There was no hearth in 55.

A length of 26 feet is greater than usual, and three beams rather than the customary two were installed to support the ceiling. Beam seatings are $6\frac{1}{2}$ feet above the floor, but an earlier, original floor lies 5 inches lower. The second-story floor offset is 8 feet 7 inches above this earlier floor.

The east wall of 55A had known a succession of doorways prior to construction of Kiva H. What I judge to be the oldest is 4 feet 7 inches from the southeast corner, its sill 8 inches above the earlier floor. As first constructed, this door measured $4\frac{1}{2}$ feet high and 28

inches wide, but subsequently a new sill was introduced 13 inches above the old one and the width was reduced to 19 inches when secondary jambs were added to support a doorslab positioned from the former house next on the east. Surplus mud from these alterations was smeared over the surrounding masonry and used to round off the new jambs. Still later the reduced opening was itself blocked and the blocking half concealed beneath a second coating of excess mud.

Another blocked door is seen in the middle of the east wall, its sill at a height of 39 inches. Irregular stonework below and to the left suggests ancient repairs. Between this sealed doorway and that first described is a puzzling break in the masonry, 44 inches high and plumb as a well-finished jamb.

A third former door in the same wall, 5 feet from the northeast corner, gives access to storage space improvised between Kiva H and the old house walls enclosing it. Presumably the door is older than the kiva but, in any case, secondary jambs had been provided for retention of a doorslab from Room 55.

The successor to these three doorways is at the south end of the east wall, 16 inches from the corner. It is 22 inches wide by 38 inches high and its sill lies 35 inches from the floor. Such a height naturally called for an assist and, however the need may have been met at first, a large block of sandstone, slightly used as a metate, was later leaned against the wall to provide a foot-high, makeshift step. Above, between the jambs, are two built-in masonry steps, each 5 inches high but with treads of 4 and 6 inches, respectively. They were the means of communication between Room 55A and the rooftop of Kiva H at the second-story level.

Beginning 4 feet from the south end of the room and paralleling the east wall at a distance of 19 inches is a series of five dismantled mealing bins. All the metates and most of the bin slabs had been removed but their former positions gave the series a total length of 12 feet 8 inches. Young women at their daily grinding knelt in the 19-inch space between the bins and the east wall, for the metate seatings were on that side, their east ends at floor level and their opposite ends a couple of inches lower. These seatings averaged 23 inches in length and their lower edges overhung by 2 or 3 inches the slab-paved floors of their respective meal basins. A hewn pine board, 5 by 25 inches and half an inch thick, had been incorporated in the floor of the northernmost basin. At the opposite end of the series a broad, thin metate of P. I-II type had been included in the slab lining of the south basin.

This prehistoric counterpart of mealing bins in their own homes so intrigued our Zuñi workmen they undertook a voluntary restoration. The results (pl. 11, B) give the general idea but are inaccurate as to details, and I neglected to make corrections before the season closed. Actually, the five metates are bedded too high. Each should rest with its upper end at floor level and the lower, a couple of inches below; each should be in an individual compartment walled with slabs on edge, as is the first of the series. Recumbent slab fragments or compacted mud should lie both at the raised end and at the sides between mill and bin walls, and the lower, open end of each mill should be 2 or 3 inches above its own section of a partitioned, slab- and clay-lined trench averaging 13 inches wide. Cornmeal ground on the several metates fell into this segmented trench and was transferred thence to waiting bowls or baskets.

Another error I failed to correct concerns the milling stones themselves. The last occupants of Room 55 had taken their metates with them, leaving only the bin outlines and imprints of the five mills. In their enthusiasm our Zuñi gathered the metates nearest at hand but did not differentiate between the troughed P. III variety that really belonged here at Pueblo del Arroyo and those of earlier vintage. Numbers 2 and 3 are of the thin, broad-margined type we found in Chaco Canyon P. I pit houses and in the older section of Pueblo Bonito (Judd, 1954, p. 137), while number 1 has an almost end-to-end mano trough and narrower walls than is typical of local metates. Furthermore, the mills should have been arranged according to their texture, the coarsest at one end of the series and the finest at the other.

In addition to the metate seatings there was another noteworthy feature in Room 55—a rectangular, clay-lined depression that abutted the south wall 42 inches from the southwest corner (fig. 12). It measured 38 inches long by 18 inches wide and was constructed upon the earlier floor, at a depth of 5 inches. A single sandstone slab was incorporated in the clay lining of the east side. Two inches beyond the north end of this curious feature is a narrower extension, 4 feet 5 inches long, 14½ inches wide at the south end and 12 inches at the opposite end. This extension, an inch shallower than the first section, is paved throughout with sandstone slabs but, for some reason, its south half is lined partly with clay and partly with slab fragments while the other half is lined with clay only.

Exploratory tests at the north end of Room 55 revealed not only the earlier floor already mentioned, but also, sunk into it, an 11-inch-wide trench 3½ inches deep. Almost but not quite paralleling the north

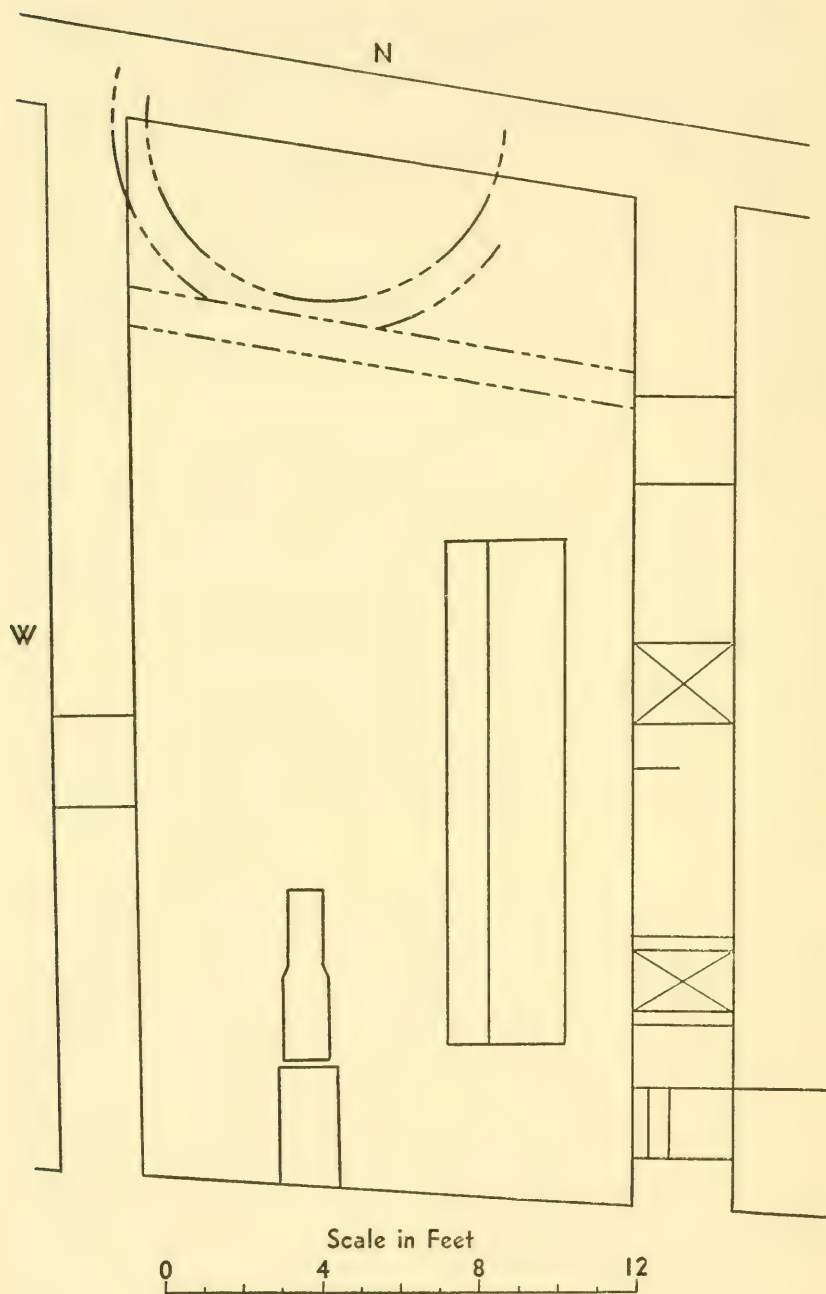


FIG. 12.—Floor plan of Room 55.

wall, this trench is floored with a single pine plank 12 feet long, 10½ inches wide, and averaging 1 inch in thickness. Adobe mud lining the trench rounds off onto the plank. A contemporary fireplace somewhere on the earlier floor is indicated by smoke-stained plaster on its associated walls. Our test also revealed the fact that finished masonry of the east wall continues 17 inches below the earlier floor and, further, that at a depth of 35 inches a 1-inch layer of shale lies within the foundation arc of a razed kiva—the only recorded instance at Pueblo del Arroyo of shale under a kiva floor. We discovered no connection between this razed kiva and the plank-paved trench above.

Rooms 56-58 appear to be no more than alcoves built to utilize otherwise wasted space following construction of Kiva H. Their sides are of relatively crude stonework abutting the plastered south wall. Despite their shallowness (Room 56 is a mere 32 inches, floor to single E.-W. beam), Rooms 56 and 57 were once connected by a door 30 inches high and 18 inches wide, subsequently blocked to leave a recess in Room 57. The sill is a wooden plank. From Room 56 a stepped doorway led down into ground-floor 55A.

Room 58, larger and more angular than the other two, probably was inhabited. Its south and east walls, part of the former dwelling in which Kiva H was built, are tied at the corner and plastered. Smoke stains on the plaster evidence an open hearth. A test hole against the east wall disclosed a well-laid floor at a depth of 58 inches and, 12 inches above it, the sill of a blocked T-shaped door. The lower portion of this door is 33 inches high; 29 inches of the upper part remains. Together, they formed a T-shaped doorway more than 6 feet in height connecting two ground-floor rooms that subsequently were preempted by the priesthood as sites for Kivas H and I.

Room 59 is an inexplicable structure at the northwest corner of the square enclosing Kiva G. Two of its three walls, concave and joined, abut the third which is the north side of the enclosing quadrangle (fig. 18). All three walls were plastered and the plaster rounded off with the adobe floor. The latter had been spread upon a fill of loose sand. We saw no trace of beam or ceiling-pole seatings.

The westernmost of the two concave walls rises to a height of 68 inches; its companion stands 54 inches high. Where the former abuts the north wall it includes a straight section 38½ inches long and 41½ inches high. In the face of this section, 24 inches above the floor, a single stone projects to form a step, 3 by 8 inches. The top of the section provides a second step, 40 inches long with a 6½-inch tread. Following a 2-inch rise the section retreats 14 inches to create what may be a third step, although it looks more like an open shelf, 30 inches

wide in front, 34 inches wide at the rear, with sides 29 inches high. If a projecting stone step was necessary in the face of the 2-foot-high section below, a similar step would appear equally desirable in the back wall of this upper, shelflike portion. There were no artifacts and no potsherds in the sand filling this queer triangular structure.

Rooms 60-61 are closetlike and were built upon the fill at the west side of Kiva G. Their north and east walls consist of salvaged blocks of sandstone and were erected with little thought of stability. An oval fireplace lies against the west side of Room 60. In the southwest corner of 61 a single post hole, 4 inches in diameter and 10 inches deep, marks the position of a former ceiling prop.

The unroofed space north of these closets provided an outdoor workroom whose pavement, at the same level as the floors in 60 and 61, lies a mere 15 inches above the floor of Kiva E on the west but 11 feet 5 inches above that of Kiva G. An open hearth, 12 inches square and 7 inches deep, lined and paved with fragments of sandstone slabs, lies 11 feet 8 inches north of Room 60 and 28 inches from the west wall.

Room 65 is one of two small structures occupying leftover space following construction of Kiva J. Its north, east, and south walls were constructed almost wholly of large, dressed blocks of friable sandstone and sparsely chinked, while the west wall was built of laminate sandstone and is perhaps superior to the average of Pueblo del Arroyo masonry. This west wall was clearly erected to complete the enclosure of Kiva F, although its builders inexplicably made a corner 1 foot from the previously erected north wall instead of abutting the latter. Adobe plaster neatly rounded that corner before the occupants of Room 65 filled the 12-inch space with their own stonework. Thereafter all four walls were plastered; the highest, on the south, still stands 6 feet 9 inches with no visible beam or ceiling-pole seatings. Surprisingly, the wall plaster remains unsmoked.

Despite its plastered walls, customarily the mark of a dwelling, Room 65 had been utilized for storage purposes. On the floor, arranged along the east half of the north wall, were five Corrugated-coil cooking pots; seven more stood against the west half of the south wall. Some had been placed on their rims, bottom up. All were crushed as they stood when the ceiling collapsed upon them (pl. 14, A). In the southeast corner, its orifice turned to the wall, was a canteen, the only nonculinary vessel in the room (pl. 28, a).

After the accident there was nothing to salvage here but the ceiling timbers. These appear to have been pulled out one by one, leaving only chunks of roofing adobe with impressions of reeds, bark, and

split cedar. Upon this debris neighboring housewives soon began to dump floor sweepings and kitchen waste. From this rubbish we recovered six more restorable cooking pots (pl. 33), a number of bone and stone artifacts, beads, paints, pumpkin seeds, and shells of pinyon nuts, charred corncobs, flint and obsidian chips left by a maker of arrowheads, and like discards. Among larger objects we noted but left in the room are: a tabular metate measuring 17 by 14 by $1\frac{1}{2}$ inches with a mano trough 14 inches long and $7\frac{1}{2}$ inches wide, fragments of 5 other metates, 18 manos and 3 fragments, 10 outworn hammerstones, and 12 fragments of sandstone tablets and door slabs.

A broken area on the east side of the floor, caused by the burrowing of a rodent, invited deeper exploration. An earlier, and obviously the original, floor was exposed at a depth of 4 inches and the finished masonry of the north wall continues 3 inches farther, there to rest upon a 7-inch-high foundation. The east-wall foundation rises a couple of inches higher. At a depth of 20 inches, beneath a purposeful fill of constructional debris, we came upon an ash-blackened pavement that antedates Room 65.

Opposite, a second test hole against the middle west wall revealed finished masonry extending 3 inches below the original floor and resting upon a 10-inch-high foundation. At the point where it was first exposed that foundation stood upon burned sand and pieces of sandstone mixed with charcoal and partly filling a large firepit. The foundation apparently bisected the pit, for that portion of it we laid bare measured 37 inches long and 28 inches deep. Its north side, 11 inches thick, passes under the west wall 9 inches below the original floor and 4 feet from the northwest corner. The inside of the pit had been burned to a depth of $1\frac{1}{2}$ inches without fusing its half-inch clay lining.

Despite the similarity of their stonework, the north wall appears considerably older than the east and south walls, and that on the west side must have followed the north by a short interval since its foundation is practically at the same level. The south and east walls abut the west and north, respectively. The better to protect its masonry from further deterioration, Room 65 was partially refilled upon conclusion of our study.

For reasons previously stated, our studies inside the main walls of Pueblo del Arroyo were concluded with the excavation of Room 65. We cleared 44 of the 58 ground-floor rooms numbered on figure 2 and, in addition, 7 kivas and various external accretions to be considered

in chapters III and IV. All pertinent architectural data recorded during our investigations are presented in Appendixes B and C. Nevertheless, before proceeding, a few generalizations seem desirable.

Evidences of constructional change, of alteration, of removal and replacement, were encountered most frequently in the middle section, between the north and south wings. The more deeply buried floors and wall remnants lie here. Major changes, as when one or more dwellings were relinquished to permit erection of a ceremonial chamber, would seem to have been forced without regard to domestic considerations. The wishes of kiva groups obviously took precedence. Ceremonialism was a powerful influence here.

Despite such evidence, Pueblo del Arroyo was a planned community. Its masonry is predominantly of the variety we called Type III at Pueblo Bonito (Judd, 1954, p. 19) but with generally larger, less carefully selected tablets of laminate sandstone and with less banding. There is good substantial stonework in Pueblo del Arroyo and there is poor stonework. Soft, friable sandstone that absorbs water and readily disintegrates was used almost exclusively in construction of Kivas I and J, for example, and these two have survived the passing centuries less successfully than their neighbors.

Some building practices were rather formalized; others were haphazard. Foundations, even for a four-story structure, might be a single course of sandstone and mud or several courses. When walls were razed the useful stones were saved, but spalls and chunks of adobe mortar were left where they fell. Replacement walls were built on top of such accumulations without thought of possible settling. Foundations are usually 2 to 6 inches wider than the walls they support, and the differences may be all on one side or more or less equally divided. So, too, with storied walls: each is usually a few inches thinner than that next below.

It is my conviction that the builders of Pueblo del Arroyo completed each storied room, both walls and ceiling, as their work advanced. When the desired wall height had been attained, the main beams were positioned, their ends flush with the opposite side of the wall, square cut and abraded. Ceiling poles were laid upon the beams and at right angles to them, often with several inches of the butt tenoned in the wall masonry. Cedar splints, locally preferred in ceilings, were next laid upon and at right angles to the poles and were bound to them by yucca-leaf thongs; splint ends were commonly anchored by a course of thicker, heavier stones. Since individual splints, less frequently strips of bark, were sometimes incased an inch or more in the masonry, I reason local masons worked more or less

blindly while building walls at ceiling level. Hence the possible irregularity, or even the absence, of what we called the "floor offset" or ledge.

An upper wall was customarily set off, or set back, an inch or more from the face of that below. This setback invariably occurs in line with the adobe surface that completes a floor assemblage and is an almost constant feature of wall interiors but rarely occurs on the outside. An offset may be poorly indicated or wider than normal; one at the end of a given room may be, but rarely is, several inches higher or lower than those on either side. Whatever the motive behind it, the offset increased the floor dimensions of each upper room over that next below and reduced the thickness of intervening walls.

As is clearly illustrated in Ruppert's sketch of the wall separating Rooms 30 and 34 (fig. 6), floors in adjoining houses are not necessarily at the same level, and floor offsets are variable. Posts installed to brace first-story ceilings were invariably set upon base slabs in dug holes. The holes were sometimes, but not always, lined with slab fragments on edge; sometimes, but not always, shale was packed between post and slab lining.

In large measure, ground-floor rooms were utilized for storage; residential quarters were on the upper floors. Customarily, storeroom walls were not plastered but those in dwellings were. Also, the principal living room was usually provided with a fireplace. Eight of the 44 ground-floor rooms we excavated in Pueblo del Arroyo were equipped with fireplaces, and one, number 40, had two hearths, one semicircular and the second rectangular.

Three second-story rooms, 8B-I, 9B-III, and 47B, likewise had fireplaces, and there can be no doubt that open hearths on upper levels, both indoors and out upon the flat rooftops, were more frequent than our data indicate. If there were a local preference as to hearth shape, it was for the rectangular since we noted 6 of this kind, while 3 were square and only 2 each of oval and semicircular form. Of the 13 fireplaces, 5 were lined with adobe mud, 3 were slab lined, 3 masonry lined, and 2 not recorded. The rectangular fireplaces in 8B-I and 47B each contained 2 stone firedogs.

Seatings for milling stones were present in Rooms 41 and 55. The first apparently provided for three mills; the second, for five. In both instances the series had been dismantled and metates removed, together with most of the sandstone slabs that had floored and walled the individual bins and meal trench. Because we recovered a number of milling stones from among the wreckage of collapsed walls and ceilings in first-story rooms, there is every reason to believe that those

mills had been installed, singly or in series, in the dwelling rooms above.

A glance at figure 2 will show a positive grouping of certain rooms as, for example, 12-13-20-21, 29-30-31-32, and 42-43-44-45. To some anthropologists this might suggest clan occupancy of the suite, and I am not prepared to argue the point. The first two groups lack external doorways—a fact that means, of course, at least one room in each unit was equipped with a hatchway connecting with the second story. Just such a hatchway was present in the southeast corners of Rooms 20B (pl. 6, A), 44B, and 46B.

At Pueblo del Arroyo lateral doorways joining rooms on the same level are usually rectangular or nearly so. Of 73 measured (counting as 2 those examined from opposite sides of the same wall), size varies in width and height from 15 by 19 inches (Room 10) to 44 by 57 inches (Room 40). Average dimensions of 52 ground-floor doors are 25 by 41 inches; only 7 are over 50 inches high. Of 20 second-story doors, the average is $24\frac{1}{2}$ by 39 inches and our single intact third-story doorway (Room 23C) measures 26 by 41 inches.

Altogether, door size appears largely a matter of chance. In no instance where two or more doors occur in a given room are measurements equal. The nearest agreement is seen in Room 41 where two doors, both 26 inches wide, are 48 and 49 inches high, respectively. In Room 27 two 26-inch-wide doorways are 42 and 44 inches high, and in Room 34 two doors also 26 inches wide are 56 and 58 inches high. Occasionally an inverted tabular metate appears as a sill, but the east door of Room 56 was equipped with one of wood.

Sill heights varied also and might be changed when the opening was altered or when a new floor was laid. Steps, if needed, might be of masonry, a slab on end, or a mud platform. Recessed stairways providing access from a first-story room to the second-story level adjoining are recorded for Rooms 41, 44, and 55. Storeroom doors were usually equipped with secondary jambs for retention of a doorslab placed from the outside, sometimes with a smaller lintel pole set into the jambs 4 or 5 inches below the main lintels. Mindeleff (1891, p. 182) says such a pole in Hopi houses of the middle 1880's was for support of a blanket in cold weather. Where secondary lintels occurred in Pueblo del Arroyo they were almost always overlain by masonry.

Tau-shaped doors, known throughout the Plateau Province from Pueblo II times to the present, have always intrigued Southwestern archeologists. Mindeleff (*ibid.*, p. 191) remarks that those he saw in Hopi towns lacked the symmetry of T-shaped doors in ancient cliff

dwellings, one jamb being "stepped at a considerably greater height than the other." Symmetry was the rule at Pueblo del Arroyo although size and sill height varied.

We have record of eight such doors, three in first-story walls and five in those of the second story. Four of the total (in 8B-I, 46B, 58A, and 62A) pierce the east wall; three (in 9B-III, 10B, and 44B), the south, and one only (24A), the west wall. This latter, subsequently closed with rude stonework, had once opened to the outside at ground level—the only known passageway in the otherwise blank west wall of Pueblo del Arroyo. In fact, our eight T doors all appear to have been blocked, in whole or in part. That connecting 46B and 47B had been sealed before the secondary north walls were introduced on either side. From 8B-I a T-shaped door in the east wall gave access to 9B-III which has a T door in its south wall. A large, irregular opening broken through the south wall of 10B framed what we believe to have been a T-shaped door and we restored it as such.

Ventilators occur with less regularity at Pueblo del Arroyo than at Pueblo Bonito. Our notes record 19, 10 in ground-floor rooms and 9 in those of the second story. Again counting as individuals those approached from opposite sides, four appear in the north wall, two in the east, seven in the south, and six in the west. In only three instances (Rooms 25A, 34B, and 35B) are ventilators paired in the same wall. Single examples occur on the east side of Rooms 51 and 65 and in the otherwise blank north walls of 30B, 31B, 32A, and 32B. Ventilators in outside walls were recorded in six rooms only (8, 9B-I, 10B, 24, 25, and 29) but we know from Mindeleff's photographs that others were present in walls since fallen. As with doorways, ventilators were sometimes blocked and occasionally the blocking was placed from one side of the wall to leave a recess on the opposite side.

Mindeleff's few photographs enable us not only to visualize the ruin as he saw it in 1887 but also to estimate the changes brought about between then and 1920, the year of the National Geographic Society's reconnaissance of Chaco Canyon. More upper walls were standing in 1887, and second-story ceiling beams could be seen here and there. Five of them protruded from the outermost north wall, immediately above four second-story ventilators, at least two of which had been blocked (pl. 16, B). If those timbers were designed to carry an external balcony, as is possible, it is to be noted that no door appears in the third-story wall then surviving. Ten years earlier Jackson (1878, p. 443) wrote that beams projected through the wall for about 5 feet "along its whole northern face the same as in the Pueblo Hungo Pavié." Unfortunately passersby in temporary need of firewood have

since pulled out the five beams Mindeleff photographed and, at the same time, toppled the overlying masonry (pl. 16, A).

Despite his implication to the contrary, Jackson probably saw no more than the five projecting second-story beams Mindeleff photographed 10 years later. In Mindeleff's 1887 view (pl. 16, B) first-story beam holes may be seen at ground level and, below them, a sloping accumulation of scattered building stones fallen from the upper third story. Standing masonry at the far right is part of that same north wall, but there were no protruding second-story timbers visible here at the time and Mindeleff's photograph lacks evidence that the intervening portion had fallen during the preceding decade. Holsinger, who made no mention of the five beams in his 1901 report to the General Land Office, apparently assumed a missing outer tier of rooms when he amended the north-wall statement printed on Jackson's plan (fig. 45).

With the ruin as a whole in mind, Jackson wrote (1878, p. 443): "Many of the *vigas* are still in place and perfectly smooth and straight undressed logs of pine, averaging 10 inches in thickness; none of the smaller beams or other wood-work now remains."

A ceiling beam spanning what may be Room 9B-I or 10B is to be seen at the left in Mindeleff's general view from the southeast (pl. 1), and the stub of another casts a shadow beneath the open third-story door at the center of the picture. In this same view, near the right margin, is a shadowed pear-shaped mass that looks like two-story masonry. It is ghost masonry, however, because, while it seems to be real enough on the original negative, it does not appear on any other Mindeleff photograph. If not a phantom, the wall fragment would stand near the easternmost, unexcavated kiva fronting the north wing, and here all was rubble in 1887 as in 1920.

Since the days of Jackson and Mindeleff not only beams but lintel poles over doorways and ventilators have been wrenched free and used for fuel. Broken door jambs were weakened and their collapse was accelerated as winter snows and summer rains softened the mud that bound the stones together. Jagged holes marking former doorways in the second-story south walls of Rooms 9 and 10 had more than doubled in size between 1887 (pl. 15, *a*) and the beginning of our investigations in 1923 (pl. 2, upper).

Loss of these old beams and lintels has forever erased tree-ring dates that would have added greatly to the history of Pueblo del Arroyo. The extent of that loss may be gaged from what has since been learned. Of many hundred selected logs, large and small, that went into the building of the pueblo, we collected only 45 samples.

These are sections cut from fragments unearthed during the course of our investigations and borings taken from beams still in place. Fourteen contributed nothing because their annual growth rings were so uniform in width they could not be read. The others gave the following dates:

<i>Field No.</i>	<i>Location</i>	<i>Cutting date *</i>
59.....	Room 12, beam	1102
60.....	" " "	1103
61.....	" " "	1103
62.....	Room 8B-I, beam	1105
63.....	Room 9B, beam under partition	1101
66.....	Room 16, east beam	1098
84.....	Room 9B, beam under partition	1102
85.....	" " " " "	1102
87.....	" " " " "	1100
88.....	" " " " "	1092
89.....	" " " " "	1100
100.....	Room 20, beam	1096
101.....	" " "	1095
102.....	Kiva C, pilaster 8	1067 + x
111.....	Beam, unnumbered room, NE. corner S. wing	1092 ± 3
124.....	Room 39, recent dump (probably from Room 38)	1064 + x
125.....	Room 34, beam	1075 + x
126.....	Room 43, "	1074
129.....	Room 44, north beam	1066
131.....	Room 46, south beam	1070
132.....	" " , prop for 131	1052**
133.....	Room 47, south beam	1066
134.....	Room 47B, one of paired beams under N.-S. partition	1077
137.....	Log in 2d-story wall, W. side of Court	1074
139.....	Log, W. side of Court, NE. of Kiva I	1091
146.....	Beam from unexcavated room next NE. corner Kiva C	1102
147.....	Beam, NE. corner Kiva C square	1103
148.....	Beam under 2d-story partition, 5th unnumbered room from W. end of N. tier	1117
149.....	Beam, 2d story, same room	1101 ± 2
152.....	Beam, 1st story, same room	1101
153.....	Beam, unnumbered room N. of Room 53	1065 + x
154.....	Beam 7 ft. N. of No. 153	1075

* Determinations by Dr. A. E. Douglass (1935) and Terah L. Smiley (1951).

+ x means the cutting date was 0 to 10 years after the date given.

± means to add or subtract the number of years indicated.

** means a provisional determination.

Of these 32 dated timbers 17 were built into the south wing, 5 into the north wing, and 10 into the section between. Of those in the first group 6 were felled between 1067 and 1098; 11 between 1100 and 1105. The 10 timbers from the middle section were all cut between 1052 and 1091, and of those from the north wing 1 was cut in 1065, 1 in 1075, and 3 between 1101 and 1117, the latest recorded tree-ring date for Pueblo del Arroyo (Smiley, 1951, p. 19). Together they suggest the period during which the village was under construction.

Tree-ring dates are not always to be taken at face value, however, for timbers in good condition were used again and again. We observed a number of instances where both kivas and dwellings at the time of abandonment had been stripped of their ceiling logs for reuse elsewhere. A most illuminating example is in Room 46A where the original south beam, with a cutting date of 1070, had later been propped by part of a log felled in 1052. The beams and door lintels destroyed between 1887 and 1923 would have added substantially to our tree-ring record from Pueblo del Arroyo and might have enabled us to fix the time of occupancy with greater assurance.



A. Burial, southwest corner of Room 40A.



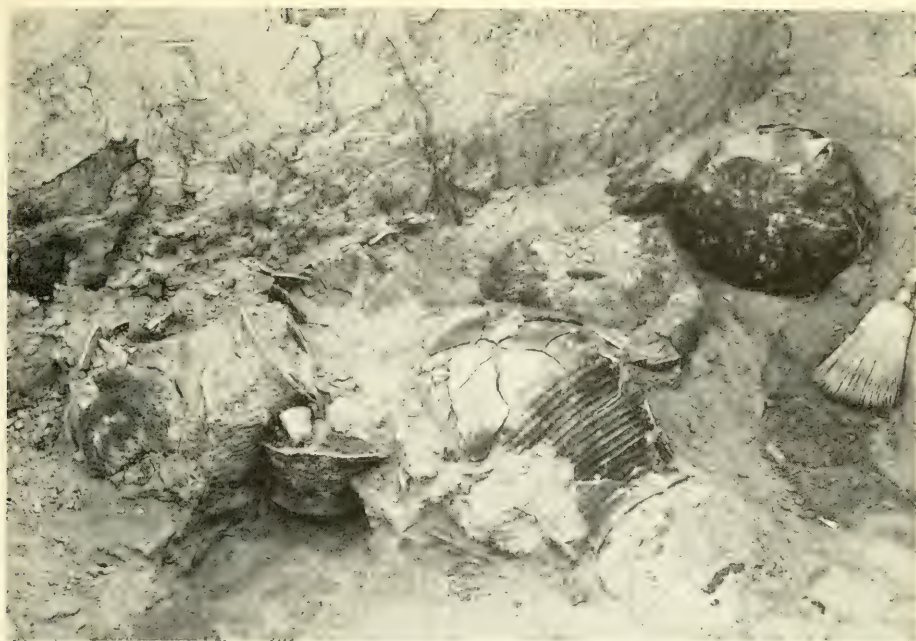
B. Skeleton of a dog, on the floor of Kiya F.
(Photographs by O. C. Havens, 1925.)



A. The body of a youth, buried on the floor of Room 13-A, had been disturbed in prehistoric times.
(Photograph by O. C. Havens, 1923.)



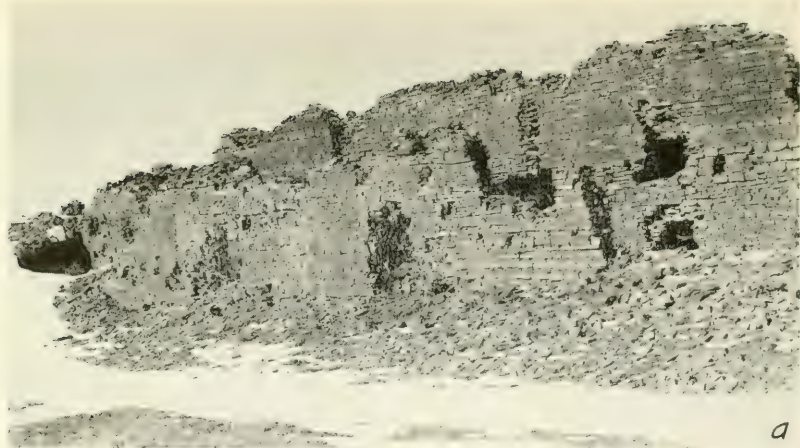
B. Doorway in east wall of Room 51, connecting with second-story Room 52B.
(Photograph by O. C. Havens, 1925.)



A. Cooking pots in Room 65, crushed by collapse of the roof.



B. Sandal figure chalked on the north wall plaster of Room 44. At left, a small repository.
(Photographs by O. C. Havens, 1925.)



a



b



c

a, The outer south wall, from the southeast; *b*, south end of Room 45B(?);
c, east tier rooms, south wing.

(Photographs by Victor Mindeleff, 1887. Courtesy of Bureau of
 American Ethnology.)



A. The north wing of Pueblo del Arroyo, from the northeast.
(Photograph by Charles Martin, 1920.)



B. Northeast corner of north wing, with second-story ceiling beams projecting from
outer north wall.
(Photograph by Victor Mindeleff, 1887. Courtesy of Bureau of American Ethnology.)



PLATE 17

Upper: Clearing the court at Pueblo del Arroyo. At center, second- and third-story south walls of Rooms 19-21.

(Photograph by O. C. Havens, 1925.)

Lower: Beginning excavation at third-story floor level, northeast corner of Kiva C square. Salvaged rocks for wall repair piled at lower left.

(Photograph by O. C. Havens, 1924.)

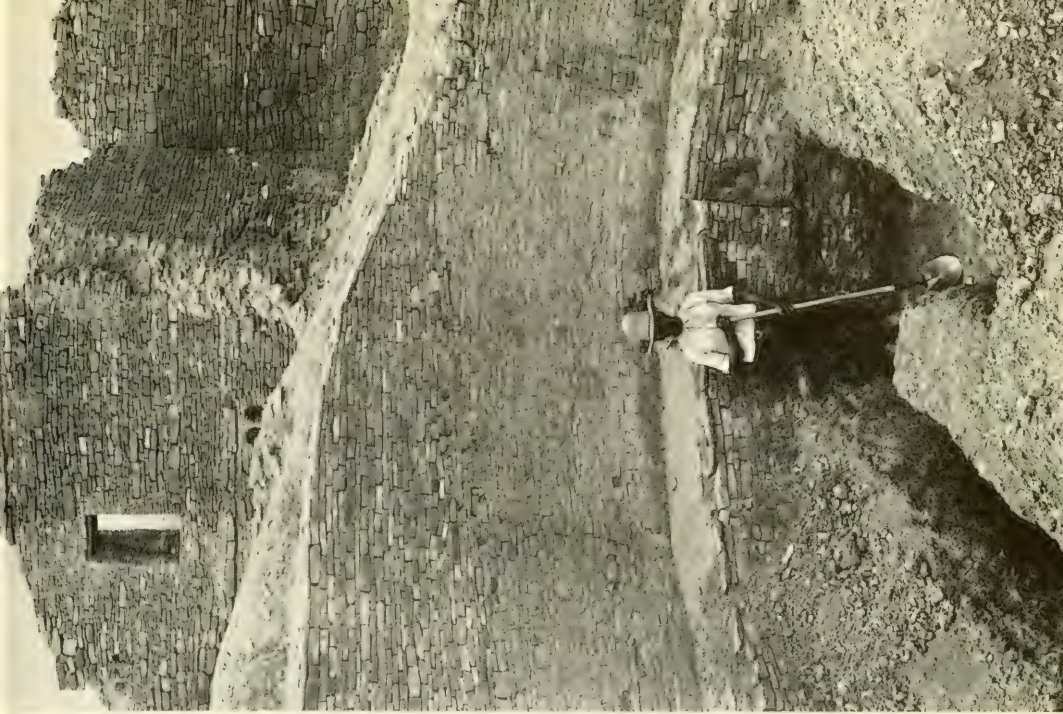




PLATE 18

Left: Clearing Kiva C. Above the wheelbarrow, the open south door of Room 28f. (Photograph by O. C. Havens, 1924.)

Right: South wall and bench recess, Kiva C, with wall restorations above the workman. At upper left, restored south door of Room 10C. (Photograph by Neil M. Judd, 1926.)





A. Fire screen, south bench recess, and rebuilt ventilator, Kiva G.



B. Southeast quarter of Kiva J showing ventilator, enlarged south bench recess, and smoke-stained plaster above.

(Photographs by O. C. Havens, 1925.)

III. KIVAS

There are perhaps 17 ceremonial chambers, or kivas, within the walls of Pueblo del Arroyo. All are circular and, in effect, subterranean. On our ground plan, figure 2, they appear to have a studied arrangement. One is conspicuously located in the south wing; two are similarly situated in the north wing; seven crowd the middle portion, and at least six are indicated between the house mass and the arc of one-story rooms enclosing the court on the east. In addition we assume the presence of a principal chamber, perhaps a Great Kiva, situated within and at the west side of the court. For this latter we had reserved the designation "A," but excavation plans for the final year were changed and we made no search for it. Kiva B and three others west of the pueblo are outsiders and will be considered as such in the next chapter.

It is now generally accepted that the circular, subterranean ceremonial room of the Pueblos evolved from the Basket Maker pit house wherein were combined family living quarters and space for the observance of family or clan rituals. The Basket Makers are best known from cultural remains they buried in caves throughout the broad drainage area of the San Juan River. Chaco Canyon lies on the south margin of that area, but its prehistoric inhabitants included occupants of at least one Basket Maker village. Here individual dwellings again served for clan and family worship, but community ceremonies were performed in a vast, semisubterranean structure 40 feet in diameter, a forerunner of the Great Kiva (Roberts, 1929, pp. 73-80).

The major ruins of Chaco Canyon represent the very summit of communal endeavor in the southwestern United States in prehistoric times. Pueblo del Arroyo is one of those major ruins and the nearest neighbor of Pueblo Bonito. Of the 17 or more kivas in Pueblo del Arroyo we excavated and examined 7. Only one, C, apparently occupies space originally set aside by the town planners. With the possible exception of unexcavated A, all are individually enclosed within a quadrangle of masonry walls. That many of these walls represent houses vacated to make way for ceremonial chambers emphasizes the dominant influence of ritual in local affairs. Kivas are still essential in the life of modern Pueblo villages, but since Conquest times when alien pressure forced the change, they have usually been rectangular rather than circular and located inconspicuously among ordinary

dwellings. In consequence, historic kivas may have lost some of their former specialized functions; several are known to have been deserted as the group responsible for its construction and upkeep gradually declined.

During his study of western Pueblo architecture, 1881-88, Victor Mindeleff observed that although the kivas were built by religious societies, none that he entered at Oraibi was then occupied exclusively for religious purposes. Each was used, especially in winter, as a meeting place for members of the society to which it belonged. "The same kiva thus serves as a temple . . . as a council house for the discussion of public affairs . . . as a workshop by the industrious and as a lounging place by the idle." (Mindeleff, 1891, p. 130.)

Parsons (1939, p. 9) confirms Mindeleff's observation: "Kivas are communal or partly communal buildings, clubhouses used by the men as meeting-place, workshop, or as a place to dance or hold ceremonies." Titiev, a later student of the Hopi, adds: "Kivas are owned by the clans whose members took the initiative in building them. In the event that a kiva has fallen into disuse, its ownership may be transferred to whatever clan is most instrumental in its repair. . . . Except on special occasions . . . females are barred from the kivas." (Titiev, 1944, p. 104.)

Every kiva-owning group is the recognized possessor of one or more distinctive rituals, each of which, it is expected, will be performed at the appointed time. The entire community benefits. Major ceremonies, usually of 9 days' duration, are conducted almost wholly in the secrecy of the kiva. Since these rites differ from each other and since each society is at pains to guard its secrets from other groups, one would expect kivas to differ. But the contrary is true. All are very much alike, inside and out. This is particularly true of kivas in prehistoric ruins throughout the San Juan drainage, including Chaco Canyon.

Half a century ago T. Mitchell Prudden examined a number of small-house sites north of the San Juan River and propounded his theory of a dwelling-kiva-burial mound complex as the nucleus, or "unit," of all Pueblo ruins, irrespective of size (Prudden, 1903, 1914, 1918). He was particularly intrigued by the kivas, and we may paraphrase his description of those he excavated in southwestern Colorado as follows:

Small-house kivas are circular, 13 to 21 feet in diameter and wholly subterranean, with an inner encircling bench about 3 feet high from which six masonry pilasters rise flush as roof supports and with shelf-

like banquettes or recesses between the pilasters; with an underground, man-sized passageway leading from the north banquette to a front room in the pueblo and a south banquette much deeper than the other five; with an above-floor ventilator tunnel under the south banquette connecting with an external, vertical air shaft; with a fireplace near the middle of the kiva floor, a deflector to protect the fire from in-rushing air, a sipapu between fireplace and north banquette and, below the latter, one or more niches in the face of the bench.

Some years later Kidder (1924, pp. 67-68) pointed out that instead of being simple and primitive, as Prudden thought, these small-house kivas are as highly specialized as those of the famous Mesa Verde cliff dwellings, many of which were still inhabited during the twelfth century A. D. (Douglass, 1935, p. 52). A combination smoke-vent-hatchway in the roof, a deep south recess with an above-floor ventilator under it, six masonry pilasters rising flush with the face of the bench and 2 to 3 feet above it, a deflector, fireplace, and sipapu are among the architectural features to be expected in Pueblo III kivas north of the San Juan River.

In contrast to this standard, ceremonial rooms in Chaco Canyon ruins generally lack the sipapu and the deep south recess. Ventilator tunnels lie beneath, rather than above, floor level. An above-floor ventilator in Chaco Canyon is invariably evidence of reconstruction. Instead of a deep south recess at bench level or above, Chaco kivas ordinarily have a shallow recess in the bench itself. These and other characteristics will be considered more fully in the following descriptions of our Pueblo del Arroyo kivas. Abbreviations used in the descriptions are: d.=deep; dia.=diameter; h.=high; l.=long; w.=wide.

KIVA C (fig. 13).

Average diameter at floor, 25' 10"; bench, 29" w. by 22" h.; south recess, 11½" d. by 6' w. in front, 6' 4" at rear; 8 wood pilasters averaging 17" w. by 26" l. by 8" h. set back 2-3" from edge of bench; "wainscoting" of poles and grass between pilasters at back of bench; 15"-by-16" opening of subfloor ventilator tunnel 16" w. by 28" d. is 5' 5" from back of recess; oriented S. 1° W., tunnel passes under middle of recess to connect with vertical shaft incorporated in outer kiva wall; shaft intake, 15" by 18"; semicircular fireplace 27" by 35" by 16" d., flat side to south; subfloor vault west of fireplace, 8' 16" l. by 46" w. by 18½" d., with clay floor, crude masonry lining, and two partitioning walls about 9" h., vault filled with clean sand; north of vault, near pilaster No. 5, single post hole 7" dia. by 9" d.; ceiling burned, timbers salvaged, and kiva thereafter used as neighborhood dump.

The facing masonry of the Kiva C main wall and bench includes both dressed friable sandstone and laminate sandstone, the latter pre-

dominating in the bench. Construction apparently began with the bench, since its rubble core was widened to form a foundation for the main wall. The facing of the latter does not extend below the bench surface but rises above it 10 feet 2 inches to court level. Time had left its mark on this masonry, so we rebuilt the upper east side in hope of delaying further disintegration (pl. 18, right).

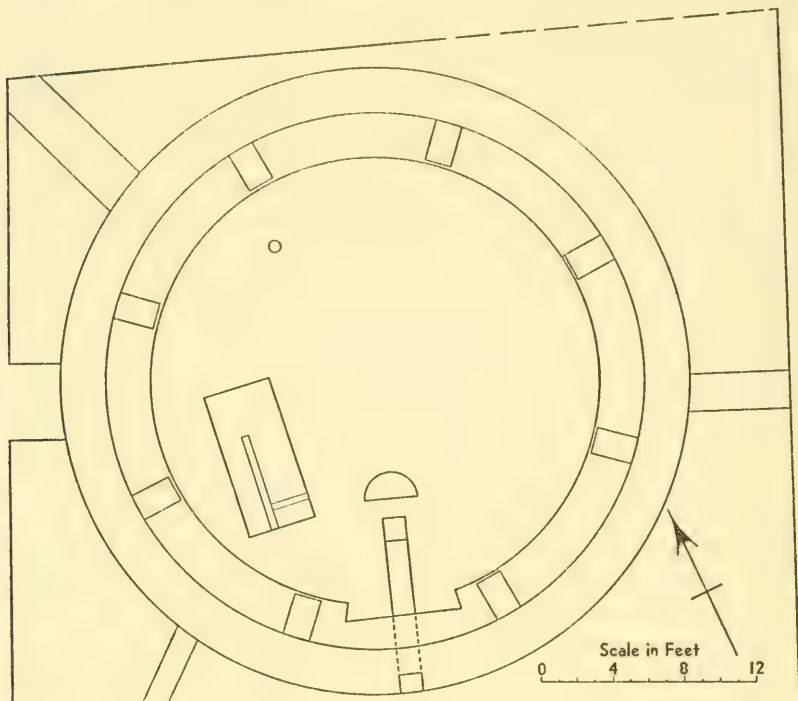


FIG. 13.—Kiva C.

On the bench as it encircles the chamber are the remains of eight pilasters, each a squared timber. All the timbers had been burned and three of them completely destroyed, but from their seatings or from dimensions of the sockets they had occupied, we know them to have measured from $15\frac{1}{2}$ to 19 inches wide and about 8 inches thick. Each timber came to within 2 or 3 inches of the face of the bench, and its opposite end was socketed in the main wall for a foot or more. Here a varying quantity of slaty coal had been packed about the log as masonry was built up over it.

Pilasters are supports for a ceiling of cribbed logs. Kiva C had eight, and the lower course of ceiling logs, in pairs, rested upon

neighboring pilasters, say 1 and 2, 3 and 4, 5 and 6, 7 and 8. The second course of paired logs joined the ends of those in the first, as 2 and 3, 4 and 5, 6 and 7, 8 and 1. Beginning with the fourth or fifth layer, a third log was added, then another and another until, as courses multiplied and height was attained, the cribwork drew toward the center creating a domed ceiling. The uppermost course was bridged by logs laid side by side and covered by cedar splints, bark or grass, and adobe mud. In the middle of this bridged area, flat and 8 or 10 feet square, a rectangular opening was left to serve both as a doorway and a vent for fireplace smoke.

In Kiva C the middle of the first pilaster, reading counterclockwise, was $24\frac{1}{2}$ inches from the south recess and, center to center, the 8 averaged 9.9 feet apart. At the rear of the bench, next to the kiva wall, post holes about 2 inches in diameter and varying in number from 13 to 15 between pilasters marked the position of a sort of wainscoting. Since the lower members of the cribbed ceiling rested directly upon the pilasters, no more than 8 inches of this wainscoting would have been visible to occupants of the chamber. Presumably grass had been crowded in between posts and wall, as in the case of several kivas excavated at Pueblo Bonito. Such a feature seems quite superfluous since the main wall was invariably plastered before construction of the ceiling began.

The cribbed ceiling of Kiva C was at least partially destroyed by fire, yet most of the logs were apparently salvable since few had been left on the floor. Although the squared pilaster timbers were consumed more or less completely during the conflagration, we recovered from their respective seatings the following sacrificial offerings:

Pilaster No. 1:	3 turquoise fragments
30 olivella beads and fragments	1 rib fragment, small deer or antelope
27 oblong and figure-8 beads and fragments	Pilaster No. 4:
9 discoidal beads and fragments	2 discoidal beads
10 turquoise fragments	1 turquoise pendant
1 standstone cover $2\frac{1}{4}$ " diameter by $\frac{1}{4}$ "	Pilaster No. 5:
Pilaster No. 2:	18 olivella beads and fragments
12 oblong and figure-8 beads	26 oblong and figure-8 beads and fragments
2 discoidal beads	6 discoidal beads
1 turquoise pendant fragment	5 abalone shell fragments
Pilaster No. 3:	2 turquoise pendants and fragment
20 olivella beads and fragments	3 turquoise fragments
11 oblong and figure-8 beads	1 cylindrical shell (?) bead with longitudinal and transverse drilling
5 discoidal beads	
7 abalone shell fragments	

Pilaster No. 6:	1 discoidal bead
16 olivella beads and fragments	1 turquoise pendant fragment
32 oblong and figure-8 beads and fragments	Pilaster No. 8:
9 discoidal beads and fragments	5 olivella beads
1 <i>Chama</i> bead fragment	70 oblong and figure-8 beads and fragments
2 shell fragments	7 discoidal beads and fragments
4 turquoise pendants and fragments	1 oval shell bead fragment
6 turquoise fragments	8 discoidal turquoise beads and fragments
Pilaster No. 7:	4 turquoise pendants and fragments
13 olivella beads and fragments	1 turquoise tessera
13 oblong and figure-8 beads and fragments	47 turquoise chips

Pilaster No. 8 was least burned and the fact that we found in it a number of turquoise beads and tiny chips leads me to the belief that like offerings might have been overlooked among the charcoal and ash of other pilasters. Similarly, the absence of stone covers for all except No. 1 suggests the use of wooden disks. The pilaster furnished a tree-ring date of A. D. 1067+x.

The subfloor ventilator tunnel or duct is masonry lined, paved with sandstone slabs, and roofed with poles of uniform diameter, split cedar, and adobe mud. The floor slabs are part of a triangular pavement that more than spans the south recess and extends over 10 feet toward the middle of the room (fig. 14).

A subfloor vault west of the fireplace requires an additional word. Its rather crudely constructed sides apparently were never plastered; packed clay provided an indefinite floor. Five and one-half inches of clean sand had been spread upon the floor and, upon that sand, two secondary walls were built. The first parallels the west side for part of its length, and the second abuts both the first wall and the east side of the vault. Both walls are about 9 inches high which brings them to within 4 inches of the kiva floor. Excepting a small quantity of wood ash against its east side the vault was filled with clean sand.

After destruction, Kiva C served briefly as a neighborhood dump. Ashes were not conspicuous but floor sweepings were present for we recovered a quantity of potsherds, three restorable pieces of pottery and a few other objects. Two unusual ladles (pl. 26, *b*, *c*) lay shattered at east bench level but not on the bench; a sherd pottery scraper (U.S.N.M. No. 334672) was found in the fireplace. Of 518 miscellaneous potsherds collected, 1 was of Mesa Verde ware; 121, or 23.4 percent, were Corrugated-coil, and 115, or 22.2 percent, Chaco-San Juan. Antelope, mule deer, and turkey bones were present,

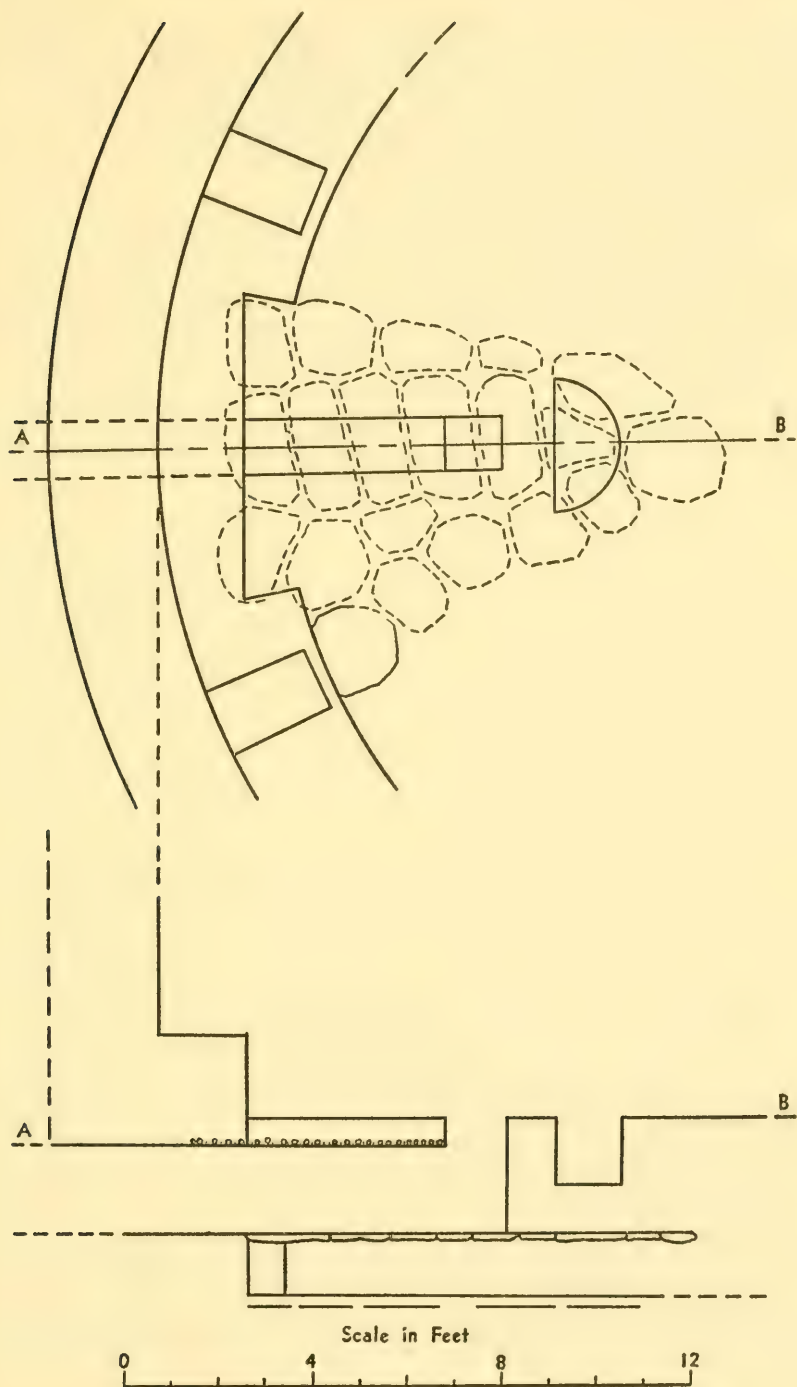


FIG. 14.—South recess and ventilator, Kiva C, with underlying pavement.

as always; also, the incomplete skeleton of a puppy (U.S.N.M. No. 334957) and several bones of a young coyote. Part of the skeleton of a prairie falcon (*Falco mexicanus*) lay about a foot above the bench between pilasters 7 and 8. Only three manos, fragments of two metates, and four hammerstones were unearthed—ample evidence that the dump was short-lived.

The most puzzling of these finds is a piece of glasslike pumice (U.S.N.M. No. 334800), as light and frothy as seafoam. It lay a few inches above the floor on the east side of the chamber, an obvious discard. As reported elsewhere (Judd, 1954, p. 293), two mineralogists identified the substance as rhyolitic pumice having a high silica content, while a third expressed the opinion that it was a fragment of perlite or pitchstone altered by fire. Near this specimen was a miniature jar (U.S.N.M. No. 334640), blistered by heat. Broken masonry from second- and third-story rooms had fallen upon this household debris to complete the fill of Kiva C.

After concluding our examination we dug an exploratory trench from pilaster No. 1 north to pilaster No. 4. At a depth of 44 inches we came upon an earlier floor or, more likely, a work surface. This abuts the bench foundation, here composed of adobe mud and chance blocks of sandstone, some of which protrude several inches. Where we bared it, the foundation stands out an inch or more from the face of the bench and is unbroken throughout its full height of 44 inches. At the south the foundation does not follow the lines of the recess as one would expect but continues across the front of it. Whether intended or not, no foundation stones protrude at this point.

The floor at a depth of 44 inches abuts the bench foundation while another, 3 inches lower, continues under. We were interested to note that this second surface is on the same level as the floor of Room 32. Twenty-two inches deeper, or 5 feet 9 inches below the kiva floor, we came upon a third pavement and, 46 inches from the north end of our trench, an unfinished or partly razed east-west wall 40 inches wide and 7 inches thick, built upon an 8-inch-high foundation. This third pavement does not appear on the north side of the 40-inch wall. From a sandy fill between the second and third pavements we recovered a single bone bead and a number of potsherds decorated with late, fine-line hachure.

To explore the quadrangle in which Kiva C stands, test pits were dug in the northeast, northwest, and southwest corners. At the northeast the butt of an 8-inch beam extends through from the adjoining unexcavated room and, on the north side of it, a comparable

timber crosses the corner at an angle, joining the east wall with the outside of the kiva. Ceiling poles resting upon this beam (pl. 10, lower) might suggest occupancy of the space beneath, but I incline to the belief they were intended merely to level the court. Ceiling poles in pairs were noted repeatedly in excavated rooms, but this is the only instance where we found them trebled.

Above the poles, masonry of the north and east walls consists of carefully laid laminate sandstone, while that below is careless and crude in comparison. This lower stonework, like the external wall of the kiva, was made with large quantities of mud and large blocks of unshaped sandstone, some of which at irregular intervals protrude 6 or 7 inches. As exposed in our 6-foot-deep test, the fill of the corner consisted almost wholly of adobe spalls from razed buildings. In this were a few potsherds of late type. The beam from the adjoining room (field No. 146) gave Dr. Douglass a date of A. D. 1102+; that across the corner, 1103. These two are more likely to represent the time of construction than is the No. 8 pilaster log, dated 1067+x.

The northwest corner was equally interesting but without the remnant of roofing. Both the north and west walls had originally been built of superior, laminate sandstone masonry; they are tied and several layers of plaster still cling to that on the north. But—and here is the interesting fact—sometime after completion the west wall facing had been torn out and replaced with a crude stonework that abuts the plastered north wall. Then a masonry brace, 22 inches wide, was built in against the new corner union to extend diagonally to tie with the outer curve of the kiva. From this diagonal, as from both the reconstructed west wall and the exterior of the kiva, building stones protrude sporadically. Debris of reconstruction filled the angle. A second, shorter brace ties with the west wall about midway of its length.

In the southwest corner the exterior wall of Room 21, below its second-story ceiling offset, seems to have been planned and built in the coarser type of stonework noted in the lower northeast and northwest corners. And here also, as in the northwest angle, the original west wall facing had been replaced. I believe this cruder uneven-stonework-with-protruding-block technique was intended to be concealed. It invariably occurs on the outside of kivas, and since the space between a kiva and its enclosing walls was always filled to roof level, it seems possible that the reconstruction we have noted on the west side of the Kiva C square was forced by a tradition of concealment.

At a depth of 6 feet 5 inches our southwest corner test came upon

an uneven pavement, overlain by charred timbers and charcoal. This wreckage must have been gathered elsewhere and dumped here, for the degree of smoking on the walls was insufficient to indicate a local fire.

The three subfloors in Kiva C and the 40-inch-wide crosswall exposed by our trench at a depth of 5 feet 9 inches remain unexplained. On a work surface 3 inches above the floor level of Room 32 a 44-inch-high foundation was built for the Kiva C bench. The need for a foundation twice the height of the bench it supports is not apparent unless it be a desire on the part of the builders to lift up their creation, to place it on a higher plane in relation to its surroundings. The flat roof of Kiva C and the filled-in corners of the square formed a courtlike area at the second-story ceiling level, a convenient dooryard for inhabitants of the third-story rooms adjoining. There are no second-story doors facing Kiva C.

KIVA E (fig. 15).

Average diameter at floor, $14\frac{1}{2}$ "; bench, 20" w. by 24" h.; south recess, 12" d. by 4' 3" w. in front, 4' 5" at rear; 6 pilasters average $15\frac{3}{8}$ " w. by $18\frac{1}{2}$ " l. by $7\frac{3}{4}$ " h., set back 2-2 $\frac{1}{2}$ " from edge of bench; 6' from back of recess, 13"-by-15" outlet of subfloor ventilator tunnel with 2" overhang on north; tunnel, oriented N. $10\frac{1}{2}^{\circ}$ E., masonry lined, slab floored, 2"-dia. roofing poles $19\frac{1}{2}$ " above floor; ventilator shaft 26" south of recess has 12"-sq. intake; 7" beyond north end of ventilator tunnel is masonry-lined fireplace 22" dia. by 14" d.; ceiling logs and pilaster offerings removed.

Both the main wall and bench facing consists almost wholly of laminate sandstone, plastered and replastered. We counted no fewer than 20 successive layers on the front of the bench, the total thickness being only 1 inch. An unusual feature of the subfloor ventilator tunnel is that three courses of stonework $5\frac{1}{2}$ inches thick overhang the north side of the outlet as though designed to deflect the draft backward.

On the bench at fairly uniform intervals are six pilasters each consisting of a section of a round log, walled at the sides with small-stone masonry and plastered over. The logs are tenoned into the main wall a foot or more; their forward ends are not covered with masonry but stand free, square cut, smoothed, and plastered. A few logs were countersunk into the bench surface; none was flattened, top and bottom, as were those in C.

Inasmuch as the Kiva E pilasters are in a better-than-usual condition it seems desirable to record their constructional details, often incomplete elsewhere. The pilasters are numbered counterclockwise

from the south recess and the distances between are front center to center.

Pilaster No. 1: Front center 19" from corner of recess; 19" l. x 15" w. x 8" h. enclosing 8½"-dia. log set back 2" from edge of bench. Hole for sacrificial offering in top of log 11½" from wall is 1½" dia. x 1½" d. and grooved around for countersunk stone disk 2" dia. x ¼" thick. Disk in place but cup empty.

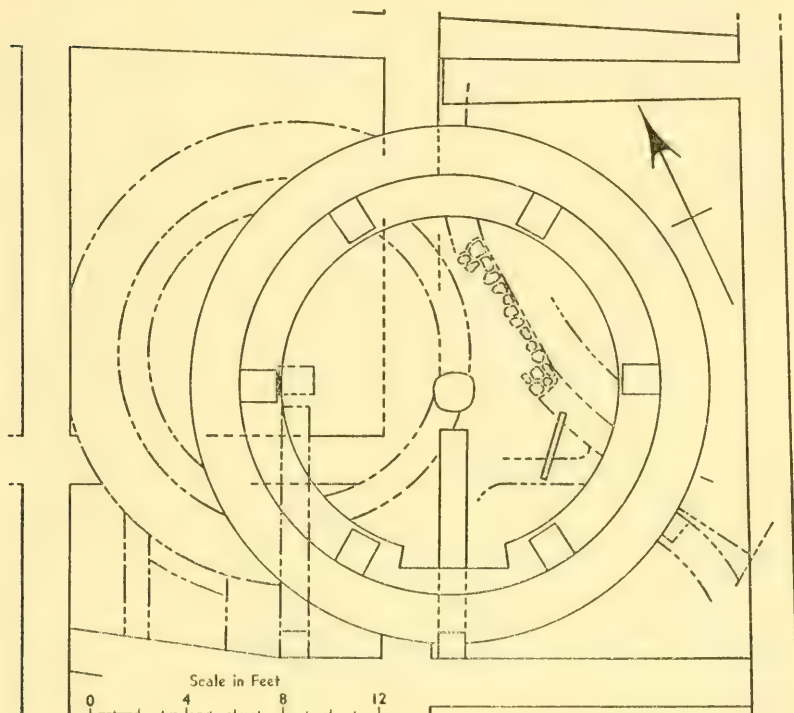


FIG. 15.—Kiva E with outlines of earlier kivas beneath.

Pilaster No. 2: 7' 6" from No. 1; 19" l. x 15" w. x 7½" h. enclosing 7"-dia. log set back 2½" from edge of bench. Offering hole 12½" from wall is 1½" dia. x 2" d.; cover not found.

Pilaster No. 3: 7' 4" from No. 2; 18½" l. x 15½" w. x 8½" h. enclosing 8"-dia. log set back 2" from edge of bench. Offering hole 12½" from wall is 1½" dia. x 1½" d. with ¼"-d. groove around top; cover not found.

Pilaster No. 4: 7' 7" from No. 3; 18¼" l. x 16" w. x 6½" h. enclosing 8½"-dia. log set back 2½" from edge of bench. Offering hole 10½" from wall is 1¼" dia. x 2" d., grooved at top; cover not found.

Pilaster No. 5: 7' 4" from No. 4; 18¼" l. x 16" w. x 8" h. enclosing log 7½" dia. set back 2" from edge of bench. Offering hole 11½" from wall is 1¾" dia. x 2" deep.

Pilaster No. 6: 7' 4" from No. 5; 17½" l. x 16" w. x 7" h. enclosing log 7½" dia. set back 2¼" from edge of bench. Log decayed; offering cup not found. From No. 6 to No. 1, 7' 2".

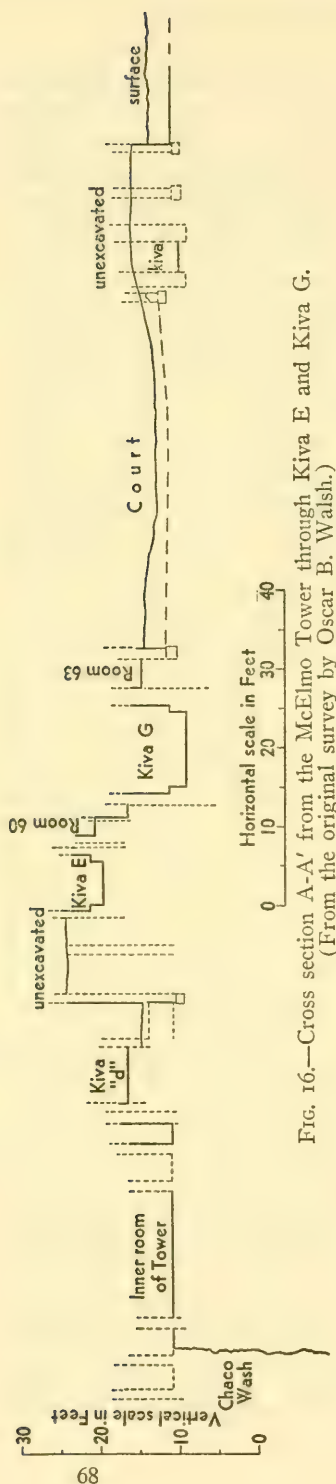


FIG. 16.—Cross section A-A' from the McElmo Tower through Kiva E and Kiva G.
(From the original survey by Oscar B. Walsh.)

Not a single bead or bit of turquoise came to light and, since broken masonry above each pilaster evidences removal of the ceiling logs, I would guess the six offerings were salvaged at the same time. Absence of covers, excepting the one of stone, suggests that they too, were reclaimed.

The elevation of Kiva E in relation to nearby structures (its floor is only 15 inches below that of Rooms 60-61 [fig. 16]) naturally prompted further inquiry. A test pit in the southeast corner of the enclosing quadrangle revealed part of an earlier kiva, its floor 10 feet below that of Kiva E. The stonework of this earlier chamber seems comparatively rough, but it is plastered and smoke blackened. The customary bench is 12 inches wide and 25 inches high and on it, incorporated in the foundation of Kiva E, we bared one side of a masonry pilaster 11 inches long and 15 inches high. This pilaster, which ends an inch from the face of the bench, was thickly coated with adobe plaster and, embedded on top, were the broken ends of a pair of ceiling logs. Despite discrepancies in bench width and height of pilaster this earlier chamber appears to be part of that previously discovered underneath Room 47B.

Following abandonment, the old kiva walls were partially pulled down and a new dwelling was erected, or reconditioned, at the second-story level. A relic of that later house is an adobe pavement, 9 feet 7 inches above the floor of the old kiva, that was cut through upon construction

of Kiva E and the remainder left to support the second-story wall built in to complete the Kiva E square and, at the same time, provide a north side for Room 47B.

Where we exposed it, the arc of the old kiva abuts sections of two straight plastered walls the significance of which was not apparent within the narrow limits of our test pit.

Part of a second subfloor kiva, perhaps the intended successor to that last described, was unearthed in the northeast quarter of Kiva E, below pilasters 2 and 3. Here, again, was a confusion of foundations, walls, and fragmentary walls.

First, immediately under the floor of E, we came upon a 3-foot-long section of curved wall, 15 inches wide, with Type III masonry on its concave face, unplastered but smoke stained. Two feet lower was what we judged to be the main wall of the chamber. It, too, was of Type III but, unlike the upper segment, was 18 inches thick and well plastered. We followed this to a depth of 9 feet 4 inches without finding an associated bench, floor, or identifiable work surface. As in the case of the kiva under Room 47B, at least two small poles had been laid in horizontally to bind the facing masonry to whatever lies behind.

Both the main wall and the 15-inch-wide section above it had been built against the plastered face and end of a straight wall, constructed of conspicuously large blocks of sandstone and extending in a north-westerly direction. The north end of this construction was partly torn out when the Kiva E bench was built and here, too, underlying the bench and abutting both the straight wall and the kiva curve is a foundationlike fill of sandstone and mud that we uncovered to a depth of 5 feet 3 inches.

At the opposite end of this straight wall the convex face of the 3-foot-long section first mentioned is abutted by a comparable length of east-west wall, 12 inches thick and of undetermined height. The angle between the two had been carefully rounded with adobe and replastered to a depth of 20 inches. When uncovered, this angular recess was filled with sandstone spalls and mud; across the top of it lay a hewn plank, 33 inches long by $3\frac{1}{2}$ inches wide by $1\frac{1}{2}$ inches thick.

Clearly this segment of subfloor kiva is part of that underlying Room 52B. In both cases the masonry is Type III and plastered; in both cases the exposed portion abuts a straight wall that lies at variance with the studied regularity of Pueblo del Arroyo. In both cases the fill is predominately debris of reconstruction.

On the west side of Kiva E, slightly underlying the bench below

pilaster No. 5, is a masonry-lined, ash-filled firebox measuring $16\frac{1}{2}$ by 14 inches by 10 inches deep. It belongs to a third kiva, perhaps never completed, that immediately preceded E since its floor is on the same level. Six and one-half inches south of the firebox is the end of a subfloor ventilator duct, 13 inches wide and 15 inches deep, masonry lined and paved with slabs. We made no effort to clear this duct as it passed under the bench of Kiva E, but later unearthed the partially dismantled intake of its connecting shaft.

The eastern half of this third predecessor had been completely razed, but sections of its foundation are still to be seen under the Kiva E bench. We traced one section to a depth of 47 inches and, in doing so, laid bare the southeast corner of the dwelling that formerly stood here.

Remnants of this earlier kiva also survive outside and to the west. But, to our disappointment, the work of demolition had been extensive. The salvaging of suitable building stone seems to have been the driving motive. In only one place did the main wall hearting extend as much as 40 inches above the bench; what remained of the latter showed a height of 22 inches and a width of 15. The masonry was chiefly of laminate sandstone with sporadic banding, the same as that of the kiva under the northeast quarter. The pilasters, if any, had been demolished without trace. We estimate the floor diameter at 12 feet.

A 3-by-4-foot test pit in the northwest corner of the Kiva E quadrangle shows 32 inches of masonry still standing above the second-story floor level. There is a 2-inch offset on the west side while on the north the second-story wall actually overhangs the first by 2 inches. Upper and lower walls had been plastered. A rotted 8-inch beam on the west side 44 inches from the corner and the decayed ends of poles embedded in the north wall are remains of a former first-story ceiling.

In the southwest corner of the square, second-story masonry stands to a height of 58 inches. It bears two coats of plaster: the first plain adobe color and the second, white. Plaster below the floor offset is not whitened. Six feet from the corner a 25-inch-wide wall juts eastward, another relic of the rooms that once stood here. In that wall fragment, 3 feet above the second-floor offset, we noted remains of a log built in horizontally for added strength.

The south wall is secondary, crudely constructed, and faced on the Room 46 side only. It abuts blocked second-story doors at each end and, about 4 feet below ceiling level, rests upon debris of occupation with which the space was filled. From the floor two clumsy buttresses

brace the outside of the old kiva. The second and wider of the two is 5 feet high and abuts the contemporary ventilator shaft which, presumably, was at least partially erected in advance of the kiva.

Kiva owners obviously are persistent builders. Reviewing the results of our several tests here we conclude that the first of the four kivas on this site is that in the southeast corner, 10 feet below the

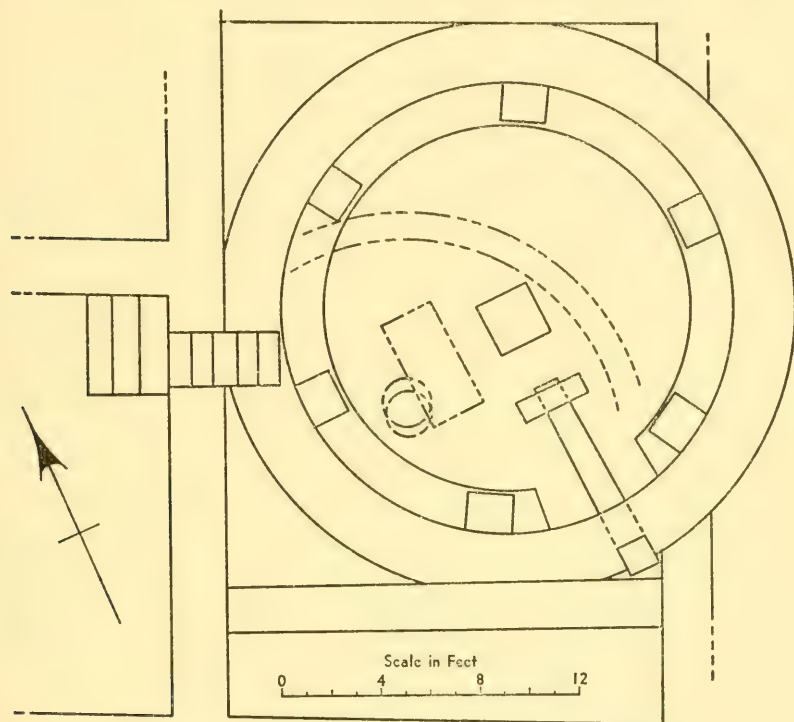


FIG. 17.—Kiva F with arc of earlier kiva beneath.

floor of Kiva E. This was followed by a larger chamber, represented by the segments under the northeast quarter of E and under Room 52B. In time this second chamber was replaced by a third after the two rooms east of 48 and 49 had been razed to make way. Then it, too, was abandoned, perhaps even before completion, in favor of Kiva E. Kiva E, therefore, was built where four dwellings formerly stood after three earlier kivas had, in succession, occupied portions of the same site.

KIVA F (fig. 17).

Average diameter at floor, 15'; bench, 19" w. by 19" h. from latest floor; south recess, 19" d. by 4' 5" w. in front, 5' at rear; no shelf at back; 6 pilasters of

squared cedar average 9 $\frac{3}{4}$ " w. by 16" l. by 7 $\frac{1}{2}$ " h., set back 3" from front of bench; subfloor ventilator tunnel 12" w. by 24 $\frac{1}{2}$ " d. ends with 12"-sq. outlet 5'9" from back of recess; tunnel, oriented N. 14° W., with lintel poles 17 $\frac{1}{2}$ " above its floor, had been filled, floored over, and replaced by lateral ventilator, 12" w. by 15" h., through middle of south recess to connect with vertical shaft of subfloor tunnel; shaft intake 13" sq.; crude masonry deflector, 34" l. by 10" w. by 15" h., built over north end of subfloor tunnel with rock fill beneath; 2' beyond deflector is fireplace 26" sq. by 14" d., upper 4" lined with masonry, offset on south side 5" d. by 5" h.; vault west of fireplace on 2d subfloor, 56" by 27" by 9 $\frac{1}{2}$ " d.

Kiva F, like E, was built where dwellings formerly stood. Its masonry is generally of Type III and its highest standing wall, on the west where a stairway comes up from Room 44, rises 6 $\frac{1}{2}$ feet above the bench. An uncommon feature is that the main wall was finished first and the bench then built against it. The customary south recess extends to the main wall, the full width of the bench, without the narrow shelf at the back.

Upon the bench are six pilasters, each a section of stone-ax-hewn red cedar resting upon a masonry base an inch thick. Each section is socketed in the kiva wall, and its front end lies about 3 inches from the edge of the bench. Instead of being enclosed at the sides with small-stone masonry, as were those in Kiva E, these pilaster logs stand exposed except for a thin coating of adobe mud. At the sides successive layers of bench plaster round up to the lower edges of the logs but no farther. Each log had been provided with a cuplike repository, grooved around the top for a $\frac{1}{4}$ -inch-thick discoidal cover; each repository had been emptied, and its cover reclaimed, when the ceiling timbers were withdrawn. To present the details we again number the pilasters counterclockwise from the south recess and measure the distances between from center to center of the forward end.

Pilaster No. 1: 23" from recess; 16" l. x 10" w. x 8" h.; repository, 7 $\frac{1}{2}$ " from kiva wall, is 2" dia. x 1" d.

Pilaster No. 2: 7' 7" from No. 1; 16" l. x 10" w. x 7 $\frac{1}{2}$ " h.; repository, 7 $\frac{3}{4}$ " from wall, 2" dia. x 1" d.

Pilaster No. 3: 7' 8" from No. 2, 16" l. x 10" w. x 7 $\frac{1}{2}$ " h.; repository, 7" from wall, 2" dia. x 1 $\frac{1}{2}$ " d.

Pilaster No. 4: 7' 7" from No. 3, 16" l. x 9 $\frac{1}{2}$ " w. x 7" h.; repository, 7" from wall, 1 $\frac{3}{4}$ " dia. x 1 $\frac{1}{4}$ " d.

Pilaster No. 5: 7' 8 $\frac{1}{2}$ " from No. 4, 16 $\frac{1}{2}$ " l. x 8 $\frac{1}{2}$ " w. x 7 $\frac{1}{2}$ " h.; repository, 4" from wall, 1 $\frac{3}{4}$ " dia. x 1 $\frac{1}{4}$ " d.

Pilaster No. 6: 7' 9" from No. 5, 16 $\frac{1}{2}$ " l. x 10 $\frac{1}{4}$ " w. x 7" h.; repository 5 $\frac{1}{2}$ " from wall, 2" dia. x 1" d. From No. 6 to No. 1, 7' 8".

The bench abuts the kiva wall and the south recess interrupts the bench for its full width. Five feet nine inches from the back wall is

the end of a subfloor ventilator duct or tunnel 12 inches wide by $24\frac{1}{2}$ inches deep; its lintel poles, $17\frac{1}{2}$ inches above its floor, are overlain with sandstone slabs covered with adobe mud. The duct lies N. 14° W. and passes under the middle of the south recess and 39 inches beyond to connect with its vertical air shaft, 13 inches square at the intake. At its north end the duct is blocked by a barrier of irregular sandstone blocks introduced as foundation for a rather crudely constructed masonry deflector built upon the walls of the duct and its 12-inch-square outlet. This deflector is associated with a ventilator outlet that had been cut through the back of the recess, 3 inches above its floor, and directly above the subfloor duct, to connect with the same vertical shaft.

Two feet beyond the deflector is an unusual fireplace, 26 inches square by 14 inches deep. The lower 10 inches of it is lined with slabs on edge; the remainder, with masonry. A second unusual feature is a steplike projection on the south side with a 5-inch tread and a 5-inch riser to the kiva floor.

A broken area beside the deflector revealed three earlier floors at a depth of 3, 4, and $5\frac{1}{2}$ inches, respectively. The deflector stands upon the first subfloor, that at a depth of 3 inches. On the floor next below, we came upon one of those puzzling sunken vaults that often occur on the west side of Chaco kivas. This one measures 27 by 56 inches and $9\frac{1}{2}$ inches deep; its clay lining rounds off neatly with its associated floor. The vault is puzzling because, like many of its kind, it was filled with clean sand and concealed beneath a 1-inch-thick adobe pavement laid throughout the chamber. It was the existence of this overlying pavement that compelled us to represent the vault as subfloor on figure 17.

When excavating for the vault its builders cut through a clay-lined, ash-filled fireplace 23 inches in diameter, a feature of the third subfloor. Five inches lower was a second and smaller fireplace. We believe both to have belonged, successively, to an earlier kiva whose wall, razed to within a few inches of its accompanying floor, immediately underlies the Kiva F bench.

The masonry of this earlier chamber is of carefully selected laminate sandstone and is plastered. From the short section of it exposed by our trench we estimate the diameter at nearly 18 feet, a figure exceeding that of Kiva F itself. Therefore, unless our observations are in error, the western arc of that earlier kiva must flatten sharply against the outside east wall of Room 44. We have assumed the east wall of 44 to be one of those originally laid down by the village plan-

ners. Its opposite was razed by the builders of Kiva F but, in their effort to use as much as possible of the old wall, the line of its west face was preserved in the kiva masonry above the east corner of the south recess and, again, near pilaster No. 3.

With substantial walls standing on the west and north of Kiva F, its required enclosure was completed by erecting new walls on the east and south. The latter brought into being the long narrow room, 62; the former is clearly an improvisation.

As stated above, all ceiling timbers and all pilaster offerings had been removed from Kiva F. During this operation chunks of roofing adobe collected almost bench high. Thereafter the empty chamber briefly became a depository for neighborhood rubbish. From this trash pile we recovered a number of interesting artifacts, some of which will be described in another chapter. In addition there were two dog skeletons, one lying on the floor at the east side (pl. 12, B) and the other (field No. A-485), about a foot and a half higher. Elsewhere in the fill were the incomplete skeleton of a young dog (field No. A-486), several jack rabbit bones, and one bone identified as that of a bobcat. Of 1,729 potsherds tabulated by Amsden and Roberts, 8 were of Mesa Verde type and 301, Chaco-San Juan.

KIVA G (fig. 18).

Average diameter at floor, $18\frac{1}{2}$ "; bench 27" w. by 26" h.; south recess 12" d., 6' 2" w. in front, 6' 7" w. at rear; 6 pilaster logs averaging $8\frac{3}{4}$ " dia. exposed $21\frac{1}{4}$ ", sided with masonry to average 19" w. by $23\frac{1}{2}$ " l. by 9" h., set back 2-3" from face of bench; repositories empty; subfloor ventilator duct $7\frac{1}{2}$ ' north of recess is 16" w. by 33" d., stripped of lintels 27" above floor, filled, and floored over; duct at angle of S. 2° E. continues 39" beyond recess to connect with ventilator shaft having 15"-by-19" intake; in recess directly over subfloor duct a 16"-w. by 15"-h. above-floor ventilator outlet cut through to connect with same vertical shaft; associated masonry deflector, 5' 2" l. by 10" w. by 14" h., with concave side to south, stands upon subfloor ventilator duct 5' north of recess; masonry-lined, plastered fireplace 32" by 37" by 28" d., $2\frac{1}{2}$ ' beyond deflector is divided by slabs on end, has 5-inch-deep steplike offset on each side.

Among those we examined at Pueblo del Arroyo, Kiva G is exceeded in diameter only by C. Its masonry, predominately laminate sandstone, stands to a height of $5\frac{1}{2}$ feet above the bench on the west side, 5 feet 2 inches on the south. On the east side the bench masonry ends, without foundation, 5 inches below the floor. Both bench and main wall have been plastered repeatedly.

Six pilasters are present and, like those in Kiva E, each consists of a round log enclosed at the sides by small-stone masonry and heavily plastered. Unlike those in E, however, the masonry siding

extends beyond the end of the log, leaving a hollow to be filled with mud at plastering time. Each log was provided with a shallow hole for a sacrificial offering but the holes were not rabbetted for covers. All six repositories had been emptied. Reading counterclockwise from the south recess, pilaster dimensions and details are as follows:

Pilaster No. 1: 22" from recess, 22" l. x 10" w. x 9" h. Log, 9" dia., extends 18" from wall; repository, 5" from wall, 2" dia. x 1" d.

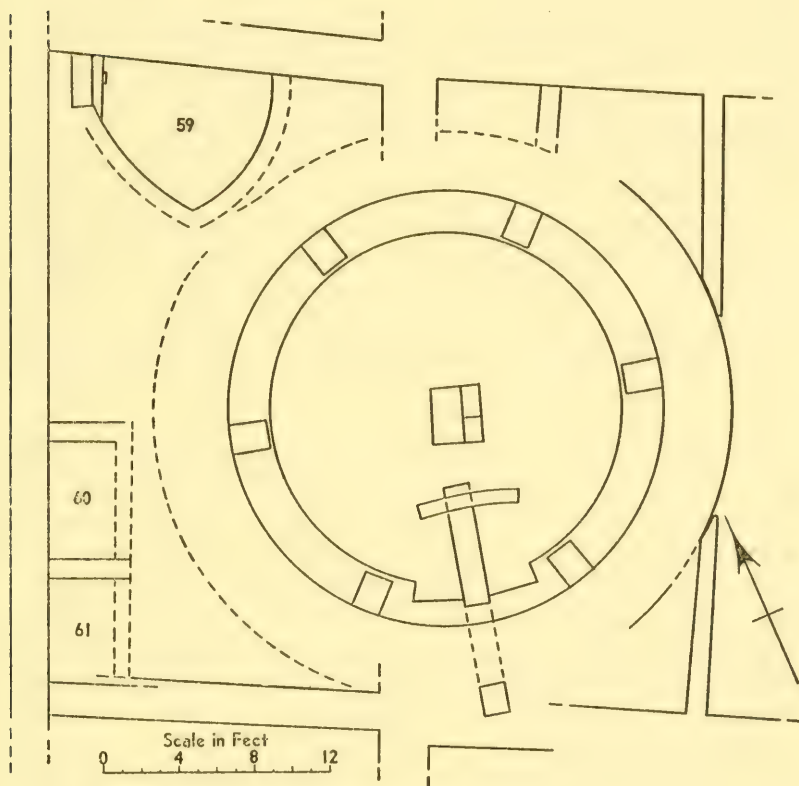


FIG. 18.—Kiva G.

Pilaster No. 2: 9' 4" from No. 1; 24½" l. x 19" w. x 7" h. Log, 8½" dia., extends 23"; repository, 6½" from wall, 2" dia. x 1" d. Log decayed and siding fallen.

Pilaster No. 3: 9' 6" from No. 2; 24" l. x 16½" w. x 10" h. Log, 8" dia., extends 22"; repository, 5½" from wall, 2" dia. x 1" d. Siding had fallen.

Pilaster No. 4: 9' 6" from No. 3; 22½" l. x 18½" w. x 9" h. Log, 9" dia., extends 20½"; repository, 3½" from wall, 2" dia. x 1½" d.

Pilaster No. 5: 9' 6" from No. 4; 24" l. x 20" w. x 9½" h. Log wholly decayed but was 8½" dia. and extended 22".

Pilaster No. 6: 9' 5" from No. 5; 23" l. x 20" w. x 8½" h. Log, 9¾" dia., extends 22"; repository, 4½" from wall, 2" dia. x 1" d. This pilaster was best preserved of the 6; on its front, 11 coats of plaster totaled 1" thick. From front center to center of No. 1, 9' 4".

The south recess is 12 inches deep, leaving a 17-inch shelf between it and the main wall. Seven feet six inches from that wall is the north end of a subfloor ventilator duct that measures 16 inches wide and 33 inches deep; it is oriented N. 2° W. and its masonry sides rise to within 6 inches of the kiva floor. Most of the lintel poles had been removed and the duct filled and floored over. Among the fill was a pile of irregular chunks of sandstone, as in Kiva F, providing a foundation for a block of masonry built upon the sides of the duct.

That masonry block is a 14-inch-high deflector, rather crudely put together with salvaged building stones, slightly curved lengthwise and the concave side toward the recess. The deflector is the accompaniment of an above-floor ventilator whose outlet, 16 inches wide, had been cut through the back of the recess at floor level to make connections with the vertical shaft belonging to the subfloor ventilator. Secondary jambs 5 inches inside the opening were designed to support a door slab, now missing. Repairs above the shelf are doubtless incident to construction of the above-floor ventilator tunnel and its air-shaft connections (pl. 19, A).

Two and one-half feet beyond the deflector is an exceptionally large kiva fireplace, 32 by 37 inches and 28 inches deep. It is floored with clay, lined with masonry, and plastered. On the east side width is increased by a steplike offset 3 inches wide and 5 inches deep. Opposite, on the west side is another, likewise 5 inches deep but with a 4-inch tread. After considerable use the fireplace had been divided lengthwise by slabs on end and, subsequently, the eastern half was divided, its northern part continuing in use as an ash receptacle while the remainder was filled with rock and sand.

The change in ventilating systems was made when the floor lay 1¾ inches lower, for the deflector stands upon this latter. Beneath is a 3-inch layer of whitish clay and then a fill of adobe and wind-blown sand. On the east side, at least, the foundationless bench masonry was begun upon that sand and adobe fill.

Although its ceiling timbers had been salvaged and its pilaster repositories emptied, Kiva G did not become an accepted community dump. Among the fallen stonework within its walls we found only 1 broken metate, 4 manos, a few lesser artifacts and scraps. Of 1,362 miscellaneous potsherds tabulated, 46, or 3.4 percent, were of Mesa Verde ware.

We attempted no exploratory tests within the Kiva G quadrangle but our observations nearby suggest earlier utilization of the site. For example, earlier structures underlie Kiva E, to the west, and the floor of Kiva G lies 8 feet below that of E.

KIVA H (fig. 19).

Average diameter at floor, 15'; bench, average 11½" w. by 20" h.; no pilasters; south recess in main wall 33" d. by 7½' at rear; recess in bench 20" d. by 4' 8" at rear, sides curve in from outer width of 7' 3"; subfloor ventilator outlet 50" north of bench recess is 17" on south, 15" on west, 23" on north; east side opens into masonry-lined duct 21" d., oriented S. 37° E. leading to vertical shaft outside east wall of enclosing quadrangle; 4" north of ventilator outlet is slab-lined, clay-floored fireplace 30" dia. by 4" d.

Kiva H, 15 feet in diameter, was built inside a former dwelling that measured 17 feet 8 inches wide and 25 feet 5 inches long. The kiva masonry abuts three sides of the old house and, perhaps in consequence of a miscalculation, it was necessary to incorporate the middle 4 feet of the straight north wall in the kiva curve. Opposite, at the south end of the appropriated house, otherwise waste space was filled with debris of reconstruction and three small second-story chambers built upon it. One of these, Room 56, became a vestibule for a stairway leading up from Room 55.

The bench in Kiva H is 20 inches high and varies in width from 10 to 13 inches. Its masonry, like that of the main wall, is chiefly of laminate sandstone, but soft friable sandstone predominates at the south side and in the south recess. The bench foundation protrudes 5 inches. Successive coats of smoke-blackened bench plaster total 2 inches. At the northwest the kiva wall stands 6 feet above its bench and that doubtless is close to the original height. Here, a foot or more above the bench, two small poles had been tenoned into the wall, tying it to the older stonework. Lacking pilasters, the chamber necessarily had a flat ceiling supported by logs reaching across from side to side.

Kiva H is unique among those we examined at Pueblo del Arroyo in that both bench and main wall are recessed at the south. The main wall is set back 33 inches at bench level creating a recess 7½ feet wide at the rear. The masonry of the bench curves in gradually on either side to form a lesser recess and leave a 20-inch-wide shelf at the back of it.

Four feet two inches north of the bench recess is the outlet of a subfloor ventilator tunnel. The outlet is irregular, measuring 15 inches on the west, 23 inches on the north, and 17 inches on the south; it is masonry lined, 21 inches deep, and floored with adobe. A large sand-

stone slab, 16 by 18 inches and an inch thick, has been set up against the north side of the opening, 5 inches above its floor. From the open east side of the outlet a tunnel extends southeast, its north wall

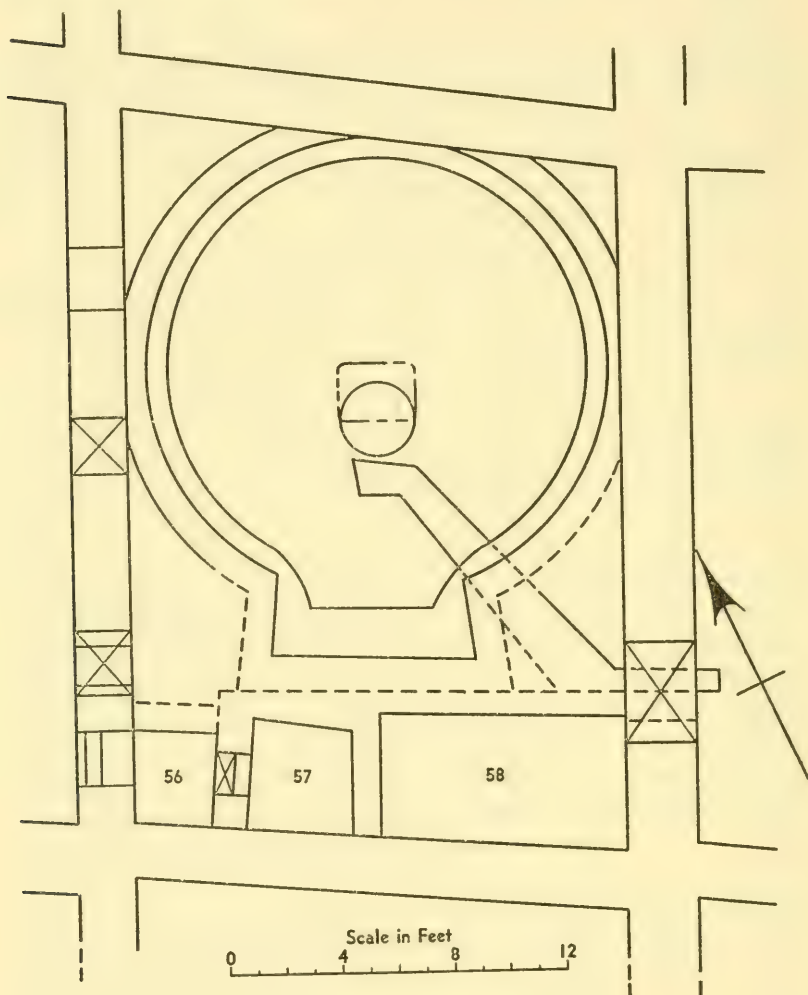


FIG. 19.—Kiva H.

oriented N. 37° W., to pass under the bench and kiva wall at the corner of the south recess. Here the tunnel is 19 inches wide but this width had been reduced by two 2-inch posts, 8 inches apart, standing on the tunnel floor and rising 13 inches above the floor of the kiva, their upper ends embedded in the bench masonry and plastered over.

Back of the posts was a single lintel pole with a flat slab resting upon it.

Outside the kiva the ventilator tunnel continues, its south side razed for some reason, passing under the east wall of the former dwelling. The tunnel had been cut through the foundation of the wall directly beneath a blocked T-shaped door and large lintels with improvised stonework inserted to support the masonry above. The vertical shaft of the ventilator was built against the east side of this blocked door.

In the middle of the kiva floor a slab-lined fireplace 30 inches in diameter partly overlies an earlier one measuring 27 by 33 inches and 2 feet deep, lined with sandstone slabs and filled with ashes and sand. The portion beyond the later, circular fireplace had been floored over.

Our only exploratory pits hereabout were two: in the southeast corner of the former dwelling to expose the ventilator tunnel previously described and in the northwest corner where smoke-smudged plaster still adheres to both walls and where, 45 inches below the second-story floor level, we came upon a solid mass of rock and mud.

We found Kiva H filled chiefly with fallen masonry and the ever-present blown sand. There were no artifacts here but, at bench level and a foot from the south recess, we unearthed a shattered adult skull and, on the north side half a foot above the bench, parts of a child's skeleton (field Nos. 465, 466).

KIVA I (fig. 20).

Average diameter at floor, 14' 10"; bench, 18" w. by 28" h.; no pilasters; south recess, 18" d. on west, 6" d. on east, 4½' w. at rear; subfloor ventilator duct 14" w. by 25" d. with 14"-by-17" outlet 5' from back of recess, continues 3' 4" south to connect with 12"-sq. vertical air shaft; duct filled, floored over, and replaced by above-floor ventilator cut through back of recess 2" above floor; outlet, 12" w. by 17" h. to lintels, provided with 3" secondary jambs 3" inside opening; tunnel oriented S. 4° W., connects with shaft of older duct; 12" from subfloor ventilator outlet, fireplace 33" by 43" and 12" d., clay floor, masonry lined and plastered; kiva fill, debris of reconstruction to bench height, debris of occupation above.

Kiva I stands within the quadrangle adjoining H on the east. Its walls, built predominantly of friable sandstone, had weathered to such an extent we refilled the room after excavation, the better to preserve what remained. Because more laminate sandstone was utilized in the bench masonry, it is somewhat better preserved. As in Kiva H, there are no pilasters.

The south recess continues to the main wall, without the customary narrow shelf at the back of it. An unusual feature at this point is that from a width of 18 inches most of the way around the bench narrows

down to 6 inches at the east side of the recess. Five feet north of the recess we came upon the 14-by-17-inch outlet of a subfloor ventilator duct, 14 inches wide and 25 inches deep, that continues under the south wall 3 feet 4 inches to its vertical air shaft. The duct had been stripped of its lintel poles, filled, and floored over, as were those in Kivas F and G.

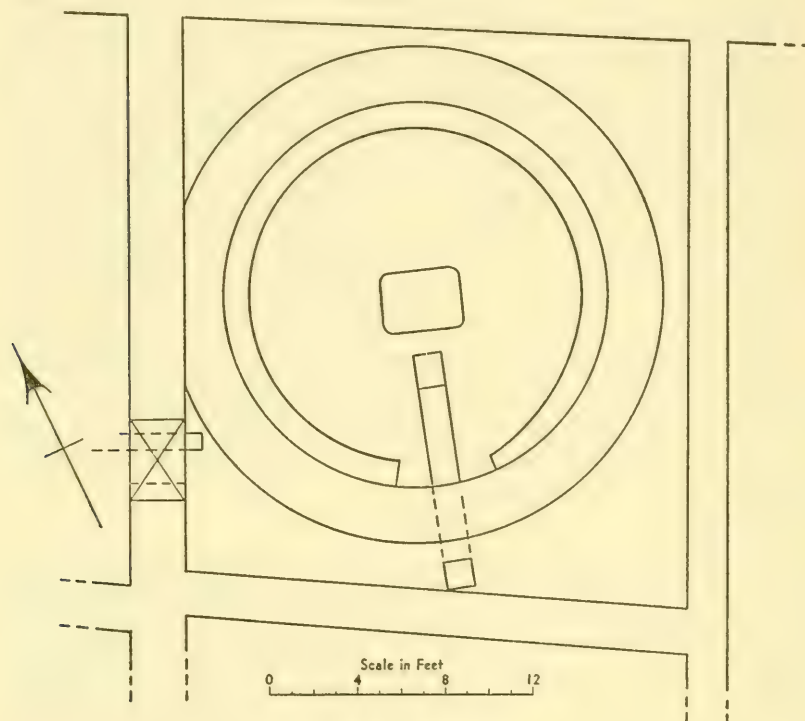


FIG. 20.—Kiva I.

Replacing that described above, a lateral ventilator was cut through the rear wall of the recess 2 inches above its floor. The opening is 12 inches wide by 17 inches to its lintels. On the left, 3 inches inside, is a 3-inch secondary jamb for retention of a slab door; its opposite was lost with collapse of the stonework. The tunnel connects with the vertical shaft of the earlier, subfloor system. This shaft is a foot square and near the top of it we found a spalled sandstone disk, 15 inches in diameter by 3 inches thick, that may have been the shaft cover.

There can be no doubt that Kiva I, after abandonment, was utilized as a neighborhood dump. Debris of reconstruction filled the lower

part, household rubbish the upper. Upon this accumulation and about 2 feet above the north bench, an uneven pavement of limited extent and a 10-inch-deep firebox evidence temporary occupancy. The firebox is exceptional for its shape and size. It measures $4\frac{1}{2}$ feet wide as it abuts the kiva wall and has an intruding 22-by-18-inch angle in the southwest corner (fig. 21). Three sandstone firedogs were standing among the ashes in the southeastern extension.

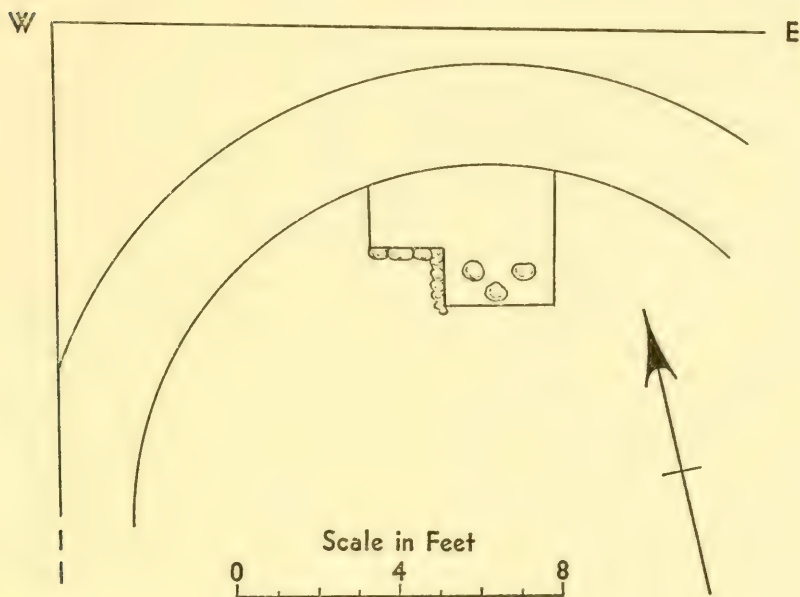


FIG. 21.—Intrusive fireplace on Kiva I fill.

A number of artifacts and discards were recovered from the fill of Kiva I, including the two stone axes shown in plate 41, *f*, *h*. Near the floor we uncovered the skeleton of a dog and part of another, skull missing (field No. 487). Elsewhere we found the skull of a badger (*Taxidea taxus*; field No. A-582) and several feet away, the mandible. Part of an infant's skeleton lay among debris of reconstruction 6 feet from the south wall and about 15 inches above the floor. Among miscellaneous bird bones recovered were those of the raven (*Corvus corax*), a rarity in local trash piles.

An exploratory trench in the northeast corner of the enclosing square showed the rude, unplastered stonework characteristic of such corners. Two small poles tied the east side to the kiva curve. A beam lying close against the north wall, with one end seated upon the east

side of the square, supported a fragment of coarse masonry that is possibly part of the foundation of a later second-story wall erected above.

In the northwest corner of the square we unearthed a puzzle. The northern 4 feet 11 inches of the west wall ends in a distinct vertical line, like a neatly finished corner, that continues below our 6-foot-deep pit and had once extended above two 9-inch beam holes near the present irregular top of the wall. This section is composed of relatively small laminate sandstone blocks, obviously selected with a view to uniformity of size. The remainder of the west wall to its union with the kiva curve is made up of larger, often undressed blocks and is capped with small-stone masonry similar to that in the northern part. There is nothing to indicate the original height of this capping, but presumably it equaled that adjoining, which still stands a foot above the two beam holes. In either case, after the capping was laid, it and the coarser stonework below were twice plastered—first natural clay and then a whitened coat—and each, in turn, was extended over the two layers previously applied on the superior masonry of the northern 4 feet 11 inches. Larger blocks of dressed sandstone, with small chips between, predominate in the lower north wall (fig. 39).

Debris of reconstruction and blown sand filled the corner. On that fill and built against the original north wall is the 20-inch-high foundation of a secondary north wall—a foundation that rests upon the irregular top of the superior west-wall masonry and had once continued westwardly above the roof level of Kiva H. Presumably this foundation had also extended the other way to join with the fragment above the northeast corner of the square.

As for the two 9-inch beam holes, it is obvious they mark the positions of timbers that once roofed either Kiva H or the room in which it was built. Had they extended eastwardly, a possibility in view of the finished masonry in the northwest corner, we must suppose a former dwelling here, one razed upon construction of Kiva I. This supposition seems implausible for two reasons: (1) In the northeast corner of the enclosing square both walls are roughly faced, and (2) the distance, 23 feet, from east to west exceeds the length of timbers customarily used by the builders of Pueblo del Arroyo.

Like its neighbor on the west, Kiva I lacked pilasters as bases for a cribbed ceiling. Its roof, therefore, necessarily rested on beams bridging the above-bench diameter of 17 feet 10 inches.

KIVA J (fig. 22).

Average diameter at floor, 11' 8"; bench, 8" w. by 23" h.; no pilasters; south recess altered; subfloor ventilator duct 12" w. by 18" d. extends north 45" from

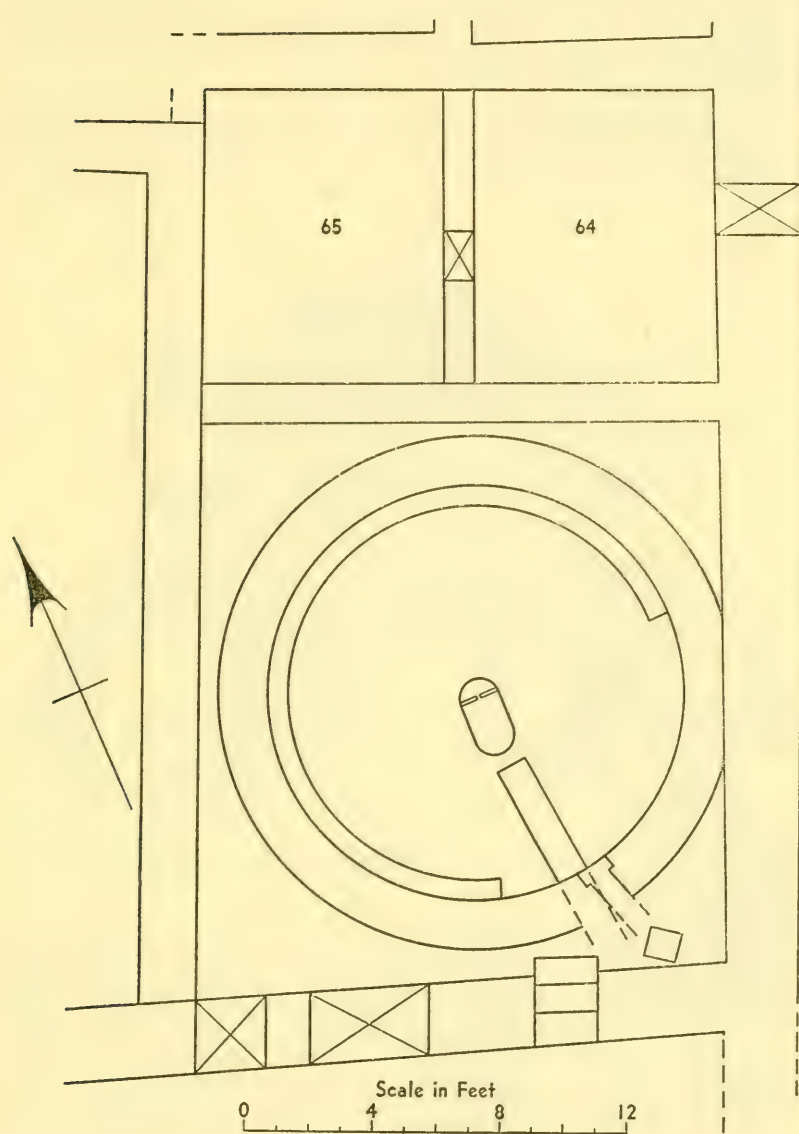


FIG. 22.—Kiva J.

back of recess at angle of N. 21° W., masonry lined, clay floored; filled, floored over, and replaced by lateral ventilator opening 13" w. by 16" h. and $2\frac{1}{2}$ " above floor of recess; 7" within opening, it is reduced to 10" w. by $8\frac{1}{2}$ " h., and floor raised $1\frac{1}{4}$ "; was cut through solid masonry S. 24° E. to reach vertical shaft of subfloor ventilator, 12"-sq. intake; fireplace, 15" w. by 31" N.-S. by 11" d., 5" from end of subfloor duct. Briefly used as a dump.

Smallest of the seven we examined in Pueblo del Arroyo, Kiva J occupies about two-thirds of a former rectangular dwelling while Rooms 64 and 65 crowd the remainder. The main wall, which still

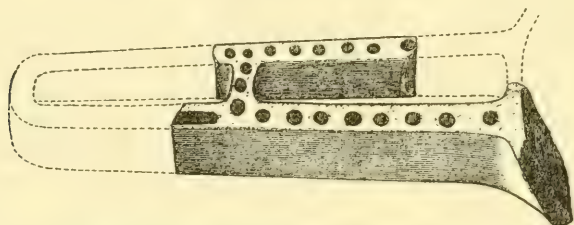


FIG. 23.—Fragment of ladle handle, Chaco-San Juan type.

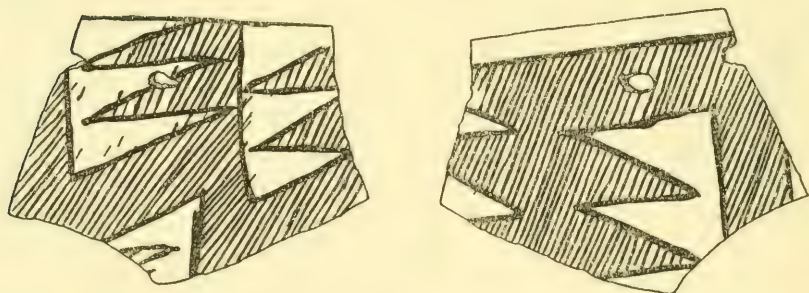


FIG. 24.—Bowl fragment from Room 39, inside and outside.

stands to an average height of 7 feet above the bench, is composed of large blocks of dressed, friable sandstone with casual chinking between. There are no pilasters; no narrow shelf at the rear of the south recess. We counted 19 coats of smoke-smudged plaster on the upper wall, a total of $1\frac{1}{2}$ inches, all being the natural yellowish brown of Chaco adobe except the second, which had been whitened.

In contrast to that of the main wall, the bench masonry is predominantly of laminate sandstone. Its rubble core ties with that of the main wall; its facing extends 4 inches below the kiva floor without foundation. An additional bond, a pole $2\frac{1}{2}$ feet long, had been embedded in the stonework on the east side just below bench level. Here,

in the southeast quarter, part of the original bench has been removed to create an abnormally wide recess (pl. 19, B).

There can be no reason for this enlargement other than planned alterations that were never completed. Incompleteness is evident from the rough, unplastered stonework at the back and east end. It is my guess that the original recess was about $4\frac{1}{2}$ feet wide while its enlarged successor is more than twice that. The usual narrow shelf at the back of the recess is lacking here, as in Kiva I. The Kiva J bench,

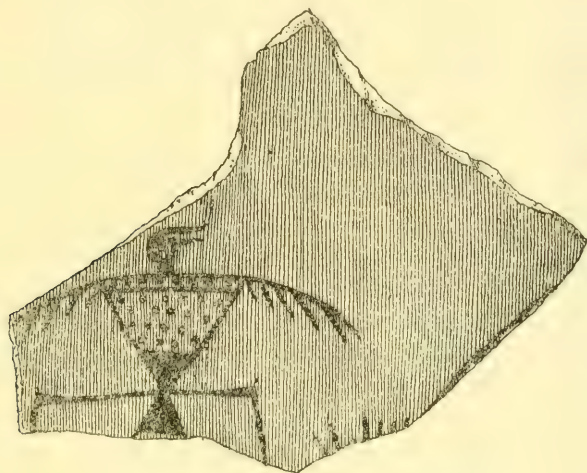


FIG. 25.—Bowl fragment, black-on-red.

without pilasters, is 8 inches wide. We found only one narrower bench and that is in the partially razed kiva underlying Room 64 wherein the indicated bench width was 3 inches; height, 25.

Three feet nine inches from the south wall of Kiva J is the end of a subfloor ventilator duct 12 inches wide by 18 inches deep; oriented N. 21° W., it had been stripped of its lintel poles, filled, and floored over. From the back of the recess the duct passes under the kiva wall and apparently bends to the southeast to meet its vertical air shaft in the corner of the former dwelling.

An above-floor ventilating system supplanted the one described above. The new outlet, 13 inches wide by 16 inches high, was cut through the wall of the recess 28 inches from its west side and $2\frac{1}{2}$

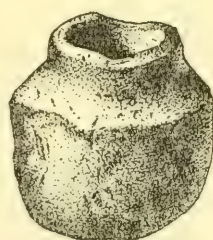


FIG. 26.—Miniature pot.



FIG. 27.—
Resonator.

inches above its floor. Seven inches inside the opening, however, dimensions are reduced to 10 by $8\frac{1}{2}$ inches and floor height increases to nearly 4 as the tunnel continues, more directly than its predecessor, toward the shaft in the southeast corner.

Half a foot beyond the north end of the subfloor ventilator duct is a fireplace, 31 inches long by 15 inches wide and 11 inches deep. Its shape is unusual and so, too, the manner of construction. Both ends are concave and lined with masonry, while the sides are of slabs that project a couple of inches above the floor. Slab fragments partition off 5 inches at the north end.

Like most of the others, Kiva J had in time been abandoned and thereafter used as a convenient dumping place for rubbish. Abandonment evidently followed shortly after initiation of intended alterations to the bench and south recess, for these proposed changes were never completed and all roofing timbers had been carefully removed and carried away. Chunks of dried mud from the roof were allowed to lie where they fell and upon them windblown sand and household sweepings gradually accumulated. From among this waste we recovered a number of discarded artifacts, a cupful of charred corn, and three large sandstone slabs, presumably doors, which we left in the kiva. Largest of the three, with rounded ends and abraded edges, measured 27 by $21\frac{1}{2}$ by $1\frac{1}{2}$ inches; the second measured 24 by 15 by 1 inches; the third and smallest, 14 by 10 inches, had seen limited service as a metate despite a thickness of only $\frac{1}{2}$ inch. Under the debris, on the floor in the northeast quarter, was a fragment of a large copper bell (U.S.N.M. No. 334766). A long-used dump would have produced a larger proportion of wornout stone implements and other evidence of household activities.

A recessed stairway (fig. 7) once led up out of Room 41 to the roof of Kiva J.

Kiva B is described in the next chapter, together with its associated rooms, but we may note here, for comparative purposes, that it was enclosed by walls

built especially for the purpose; that it had an above-floor ventilator and a narrow, encircling bench with a shallow south recess but no pilasters. The bench lacks masonry except in the south recess.

SUMMARY

In these eight kivas, including B, one finds similarities and dissimilarities. All eight are circular in floor plan and masonry lined—cylinders of masonry sunk into a quadrangle of straight walls reclaimed from appropriated dwellings or purposely erected to produce a subterranean effect. All eight are provided with the traditional bench encircling the floor, but four of those benches bear low pilasters for support of ceiling timbers and four do not. All eight have a centrally located fireplace, and two once had subfloor vaults west of the fireplace, subsequently filled and floored over. The seven kivas within the main walls of Pueblo del Arroyo were originally equipped with subfloor ventilating systems although four of these were later converted into ventilators opening above floor level. Kiva B alone was furnished with an above-floor ventilator at time of construction, but B is not a typical Chaco Canyon kiva.

The masonry of B is quite non-Chaco in appearance; like that of its associated rooms, it consists of salvaged rocks carelessly put together. The Kiva B bench is of earth, left in place when the pit was dug; its only stonework is that lining the south recess. In contrast, most of the seven kivas we excavated inside the pueblo were walled with laminate sandstone intermittently banded. For these seven, diameter at floor level

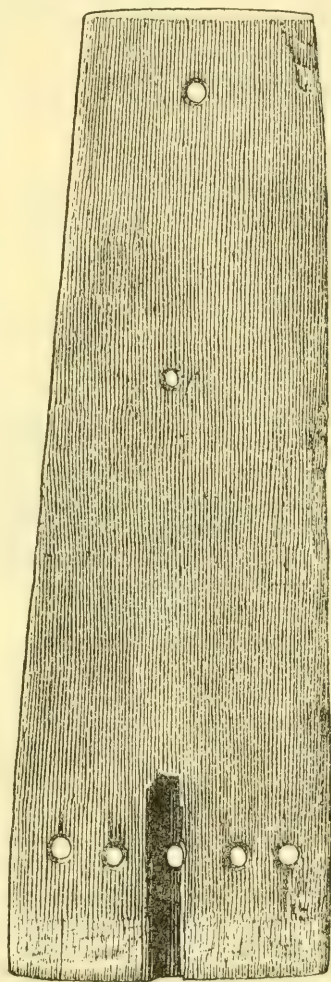


FIG. 28.—Object of cedar, use unknown.

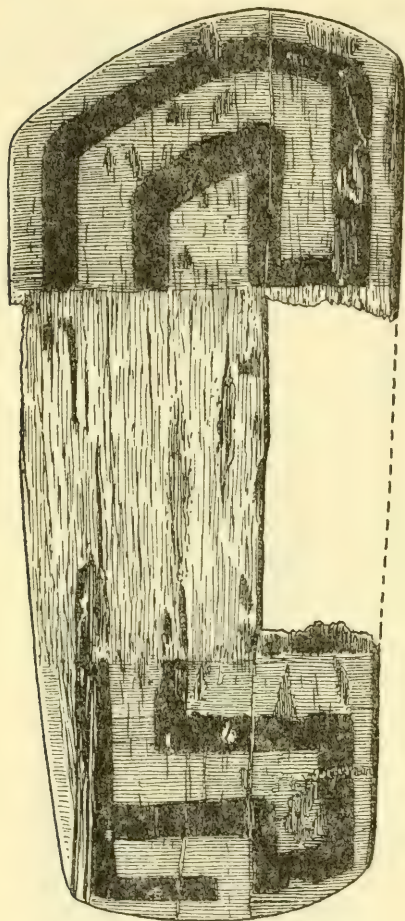


FIG. 29.—Sandal effigy of wood.

varies from 11 feet 8 inches to 25 feet 10 inches; bench width varies from 8 to 29 inches. Bench masonry invariably excels that of the main wall. In two instances, C and J, the rubble foundation of the bench merged with that of the wall above.

In relation to its surroundings, each of the eight kivas occupied a simulated subterranean position whatever its actual elevation. The five grouped at the west side of the court, Kivas F to J, were so constructed as to bring their roofs at the second-story level, while E and unexcavated D lie a story higher. Kiva C also was purposely raised until its flat roof provided a dooryard for occupants of third-story houses adjoining.

Each of the eight kivas, including B, has a south recess in its encircling bench but these recesses vary in width and depth. In three instances, F, I, and J, the recess extends the

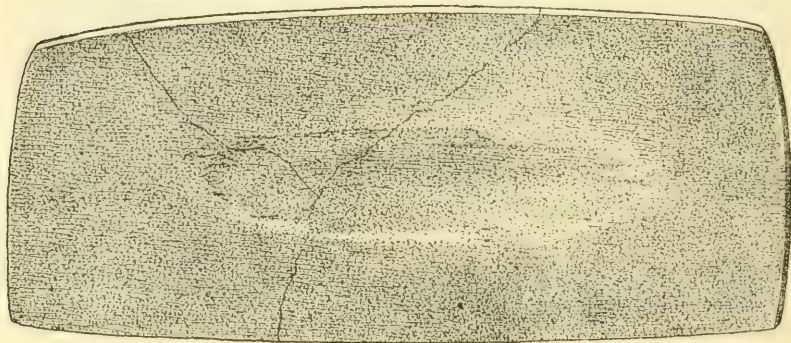
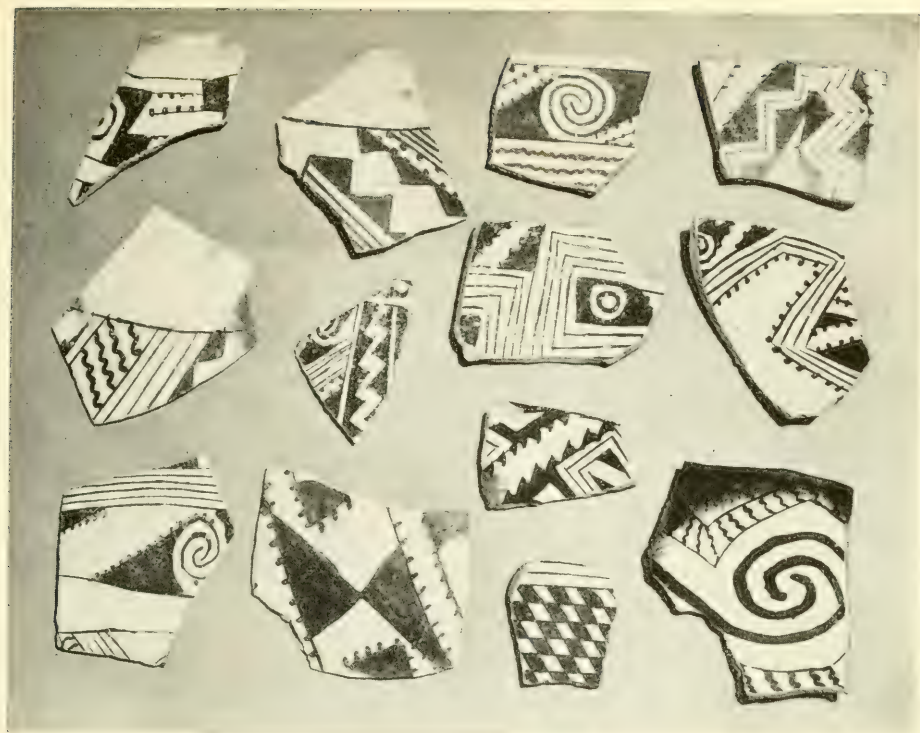


FIG. 30.—Tablet used in making ornaments.



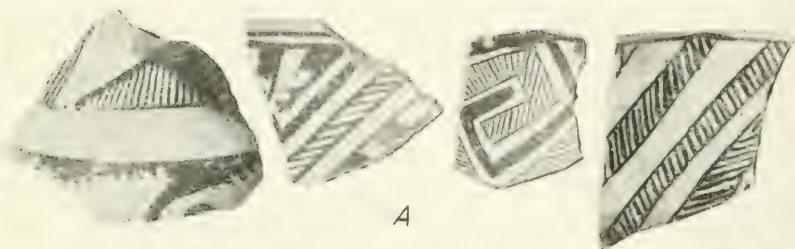
A. Bowl and jar fragments of Transitional ware.



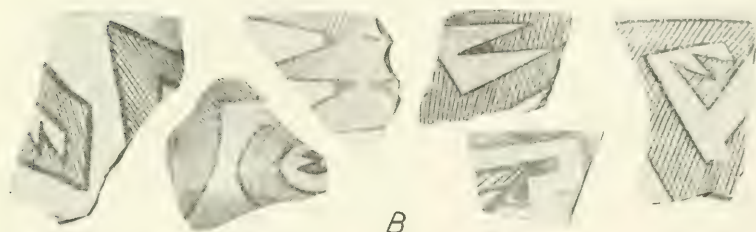
B. Sherds bearing typical Solid-type designs.



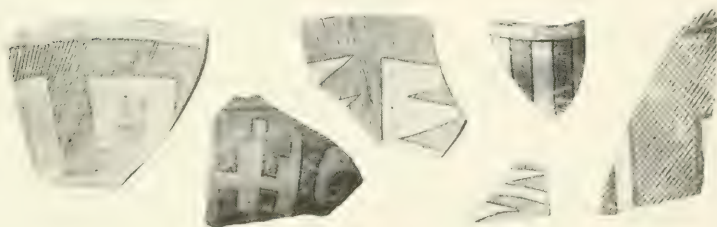
A. Bowl and jar fragments of typical Chaco-San Juan ware.



A

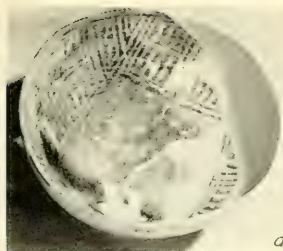


B



C

B. Sherds illustrating straight-line hachure in styles A, B, and C.



a



b



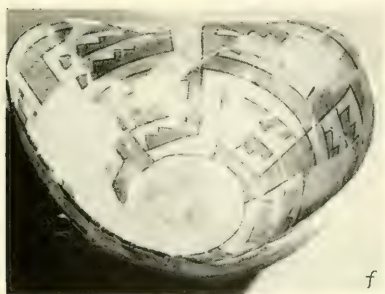
c



d



e



f



g



h



i

PLATE 22.—Bowls from Room 14 (*a*), Kiva F (*b*), Room 28 (*c*), Room 15 (*d-f*), and Room 27 (*g-i*).

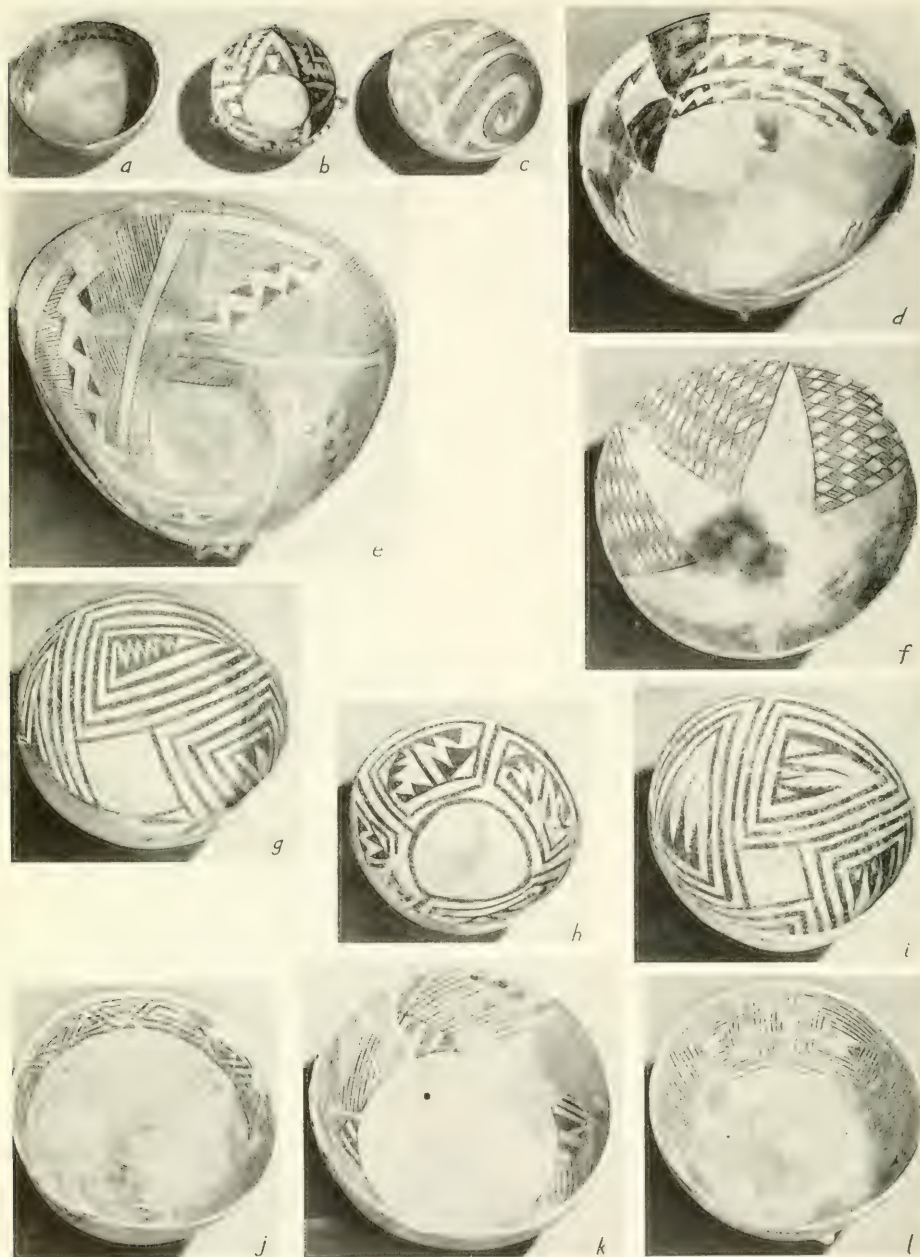


PLATE 23.—Bowls from Rooms 28 (a), 43 (b), 32 (c-f), and 39 (g-l).



PLATE 24.—Bowls from Rooms 44 (*a, b*) and 27 (*c*); bowl and pitcher from burial in Room 40 (*d, e*), and miscellaneous vessels (*f-j*).



PLATE 25.—Bowl with polished black interior and an old design in matte paint.

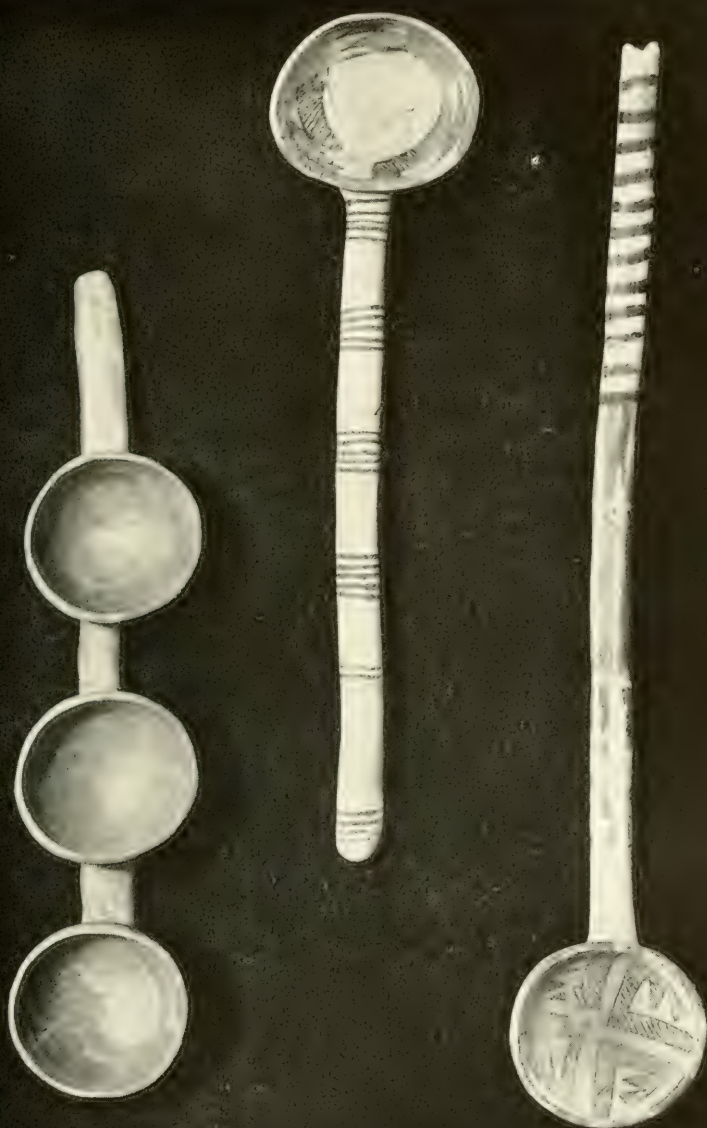
*a**b**c*

PLATE 26.—Three eccentric ladles from Room 27 (*a*) and Kiva C (*b*, *c*).



PLATE 27.—Ladles and fragments from various rooms.

full width of the bench, with no shelf at the rear. In one case only, Kiva H, the main wall of the chamber is also recessed—an echo of the “deep south recess” in kivas of Prudden’s unit-type ruins and others north of the San Juan.

Four kivas, C, E, F, and G, have low pilasters spaced at regular intervals upon the bench as supports for a ceiling of cribbed logs. All are rectangular and built either of squared timbers thinly coated with mud, as C and F, or of round logs walled at the sides with small-stone masonry and thickly plastered, as E and G. In both methods part of the log was built into the kiva wall at time of construction leaving the remainder thrust forward upon the bench. Whether bare or incased in masonry the pilaster logs did not extend to the edge of the bench but stopped about 2 inches short. This was true even of the partly razed kiva deep under the floor of Room 47B, with four logs in each pilaster instead of one. On top, nearer the wall than the forward end, was a small hole, made to receive a sacrificial offering—repositories permanently sealed when the cribbed ceiling was constructed upon the pilasters. Kivas lacking pilasters, as B, H, I, and J, were roofed with logs reaching from wall to wall.

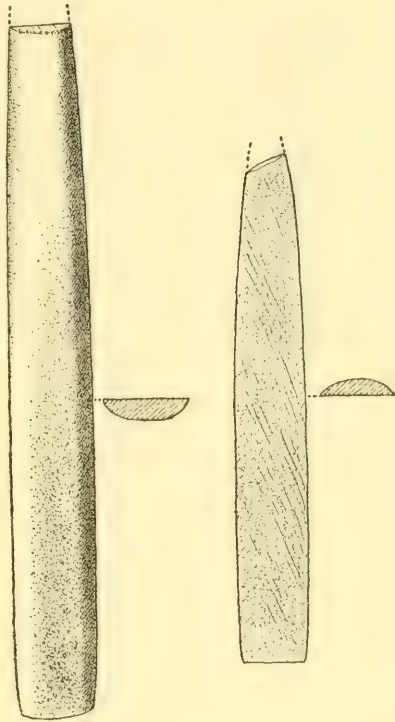


FIG. 31.—Sandstone “files.”

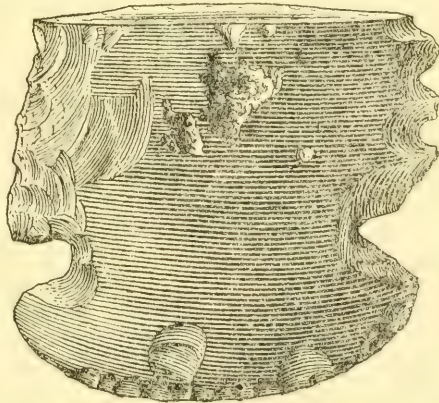


FIG. 32.—Obsidian knife fragment, abraded and rechipped.

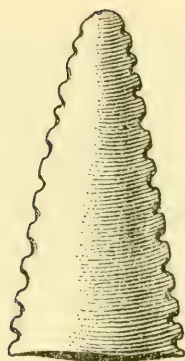


FIG. 33.—Tip of argillite blade.

Ventilation was provided by an external air intake and an outlet inside the kiva. Air heated by the central fireplace would rise to escape from the overhead hatchway, drawing fresh air down the outside shaft and through a tunnel to the outlet, thus creating a circulation that seems to have been adequate.

Each of our eight kivas is furnished with such a ventilating system. In B the outlet is in the south recess and above floor level; the other seven have, or had, their ventilator outlets in the floor 6 or 8 feet in front of the recess. The below-floor air passage or tunnel is a characteristic of the Chaco-type kiva. In four of those in Pueblo del Arroyo, however, F, G, I, and J, this subfloor tunnel had been dismantled and replaced by a lateral air passage cut through the rear wall of the recess to connect with the vertical shaft belonging to the abandoned system. In F and G, masonry deflectors were built in to shield the fireplace from side drafts, but in I and J comparable results were apparently realized merely by reducing the size of the outlet.

Although the same data are included in Appendixes B and C, it seems desirable to brief them here in order that our eight kivas may be compared the more readily.

Kiva	Diameter		Bench		Pilasters	Ventilator	
	On floor	Above bench	Width	Height		Below	Above
B	11' 6"	13' 6"	12"	34"	0		X
C	25' 10"	30' 8"	20"	22"	8	X	
E	14' 6"	17' 10"	20"	24"	6	X	
F	14' 11"	18' 1"	19"	19"	6	X	X
G	18' 6"	23' 0"	27"	26"	6	X	X
H	15' 0"	16' 10"	11"	20"	0	X	
I	14' 10"	17' 10"	18"	28"	0	X	X
J	11' 8"	13' 0"	8"	23"	0	X	X

Whether or not kiva builders took bearings on the stars when laying out their ceremonial chambers, no two of ours are oriented alike, the variation of the subfloor air passage being from N. $10\frac{1}{2}^{\circ}$ E. to N. 30° W. As regards fireplaces, two are square or nearly so; two are decidedly rectangular, two are circular, and one semicircular. In Kiva H a fireplace 30 inches in diameter and four inches deep had replaced one 27 by 33 inches and 2 feet deep. One hearth is lined with slabs, three are masonry lined, two are lined with a combination of masonry and slabs, and my notes are indefinite in the case of two.

Among the seven inside Pueblo del Arroyo, C is perhaps the purest example of a Chaco Canyon kiva. It is the only one having eight pilasters, to be sure, but these are thoroughly typical. Its south recess is less than half the depth of the bench, leaving a shelf between recess and wall. Its subfloor ventilator duct is paved with slabs, walled with uniformly sized blocks of laminate sandstone, and roofed with selected small poles, a layer of slabs, and a thick adobe floor. The duct vents $5\frac{1}{2}$ feet north of the recess but continues south, under the kiva wall, an additional 18 inches to meet its vertical shaft. The subfloor vault in C measures $8\frac{1}{2}$ feet by 3 feet 10 inches by $18\frac{1}{2}$ inches deep, almost twice that in Kiva F.

With the possible exception of C, none of the kivas we examined had been included in the original plan for the pueblo. Kiva H was squeezed into a former dwelling and so, too, the partially razed kiva under Room 47B.

The depth, or apparent depth, of Pueblo del Arroyo kivas caught Jackson's eye. One near the east end of the north wing "27 feet in diameter, was three stories in height. . . . The interior is nearly filled up, but it was originally over 25 feet in depth." (Jackson, 1878, p. 443.) In the south wing, the roof of Kiva C provided a dooryard for occupants of third-story rooms adjoining, but we estimated its ceiling height at only 10 feet. Apparently floor and walls had been raised several times.

Subfloor walls, if any, have been considered in our description of each kiva. There can be no doubt of the degree of priestly or kiva-group authority after studying the sequence of residential sacrifices leading to Kiva E, for example: first the original Room 47 was

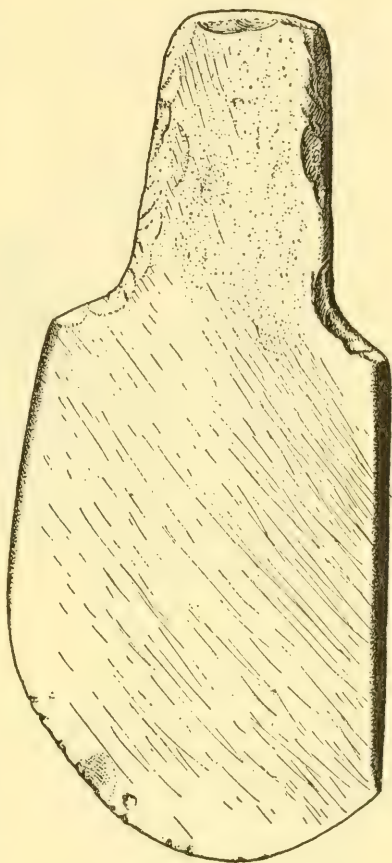


FIG. 34.—Stone hoe, or tcamahia.

taken over, then the room next on the north and, finally, the pair immediately west of these two. Even before the third one had been completed it was replaced by E, its floor 10 feet above that in the first of the series.

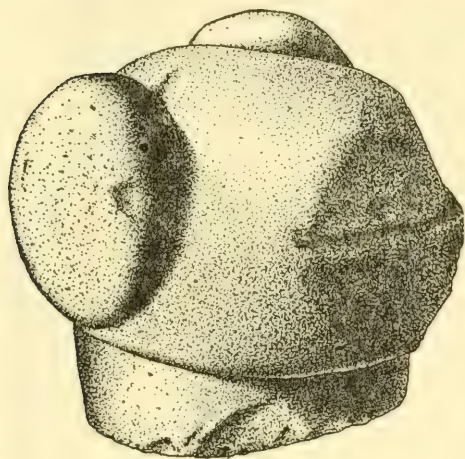


FIG. 35.—Head of "mountain lion."

Kiva C was at least partially destroyed by fire; the cribbed ceilings in E, F, and G had been deliberately removed and their pilaster offerings reclaimed. Ceiling timbers in Kiva I likewise were salvaged. As usual in such demolition work chunks of roofing adobe, bark, spalls, and other waste was allowed to lie where it fell. In each instance the depth of the fallen debris approached bench height, and upon it household sweepings from

nearby dwellings soon began to accumulate. The quantity of this domestic debris was surprisingly limited, however. Potsherds were always present but the number of bone awls, broken and discarded stone implements, bird and mammal bones recovered falls far below what one would normally expect from such dumps. One gathers the impression that not many people were living thereabout at the time.

Kiva B has a narrow bench with a shallow bench recess at the south and an above-floor ventilating system. Each of the seven we examined within Pueblo del Arroyo had originally been equipped with subfloor ventilators, but four of these were subsequently replaced by ventilators like that in B. Above-floor ventilators are standard equipment in P. II–P. III communities north of the San Juan River, and they are usually accompanied by a deep south recess above bench level and by a sipapu in the floor north of the fireplace. There are exceptions but not many. Although the narrow bench without pilasters occurs sporadically, most northern kivas were provided with masonry pilasters rising flush with the face of the bench and 2 to 4 feet higher (Kidder, 1924; Martin, 1929, 1936; Brew, 1946). In ruins with marked Chaco affiliations to the south, the below-floor ventilator and the sipapu again occur together (Hodge, 1923; Roberts, 1932).

None of our eight kivas was provided with a subfloor layer of shale, a standard provision at Pueblo Bonito, but such a layer was present in the razed kiva partially underlying the north end of Room 55.

Low pilasters set back an inch or more, a south recess in the bench rather than in the wall above it, a subfloor ventilating system, and absence of the sipapu are earmarks of the Chaco kiva. In none of our eight at Pueblo del Arroyo, including B, did we find an indubitable sipapu. Three, with benches 8 to 18 inches wide, are without pilasters. Four have pilasters on benches varying in width from 19 to 29 inches, and in each case the pilaster is less than a foot high and is set back from the edge of the bench. From P. II and Early P. III ruins in the La Plata Valley, southeast of Mesa Verde National Park, Morris (1939) reports a number of kivas with shallow south recesses in the bench, sometimes accompanied by a deeper banquette above, and pilasters set back an inch or two. Unlike those of the Chaco, however, La Plata Valley kivas usually have the sipapu; the subfloor ventilator is rare.

Northwest of the Mesa Verde, Martin (1930, 1936) reports both above-floor and below-floor kiva ventilators even in the same ruin. The associated pottery he describes as "Mancos" and "McElmo" and sherds of those two wares predominate in late P. II and Early P. III ruins north of the San Juan and they are conspicuous in our Pueblo del Arroyo collections. Migrant makers of "Mancos" pottery may very

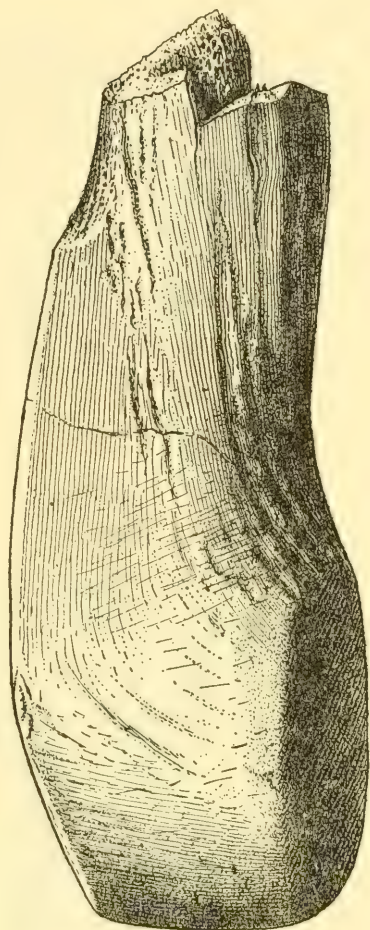


FIG. 36.—Head of antler club.

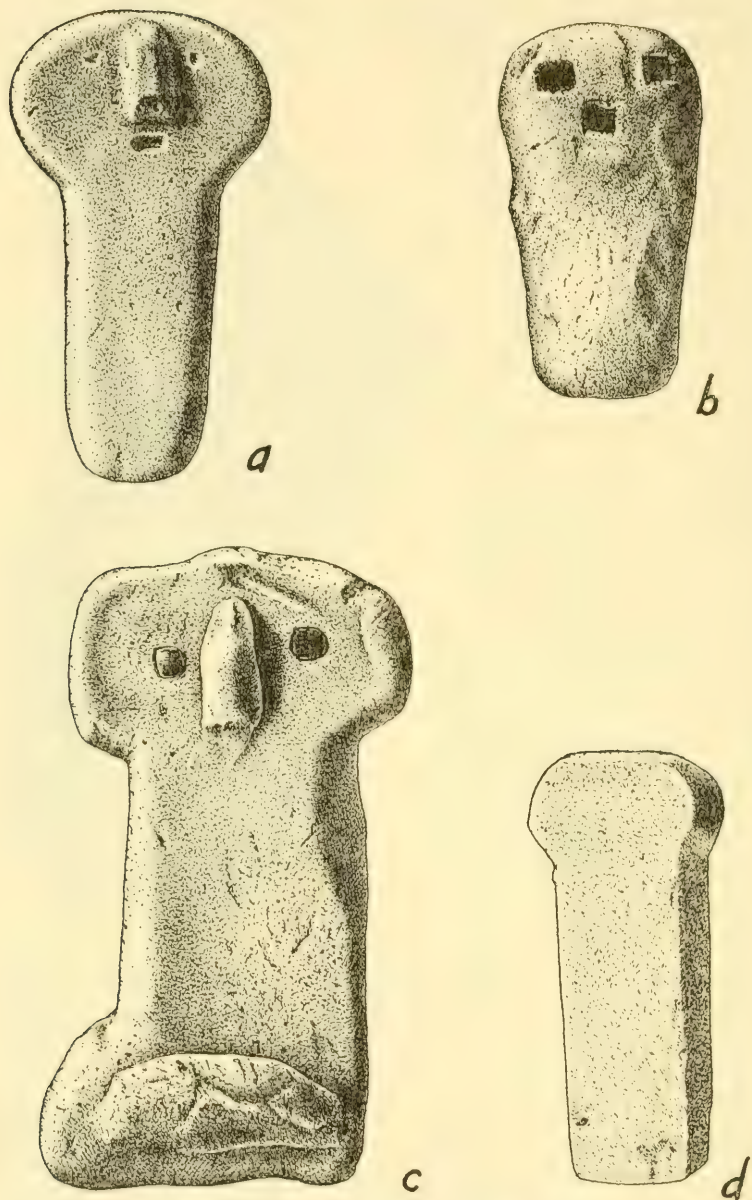


FIG. 37.—Figurines of clay (*a-c*) and sandstone.

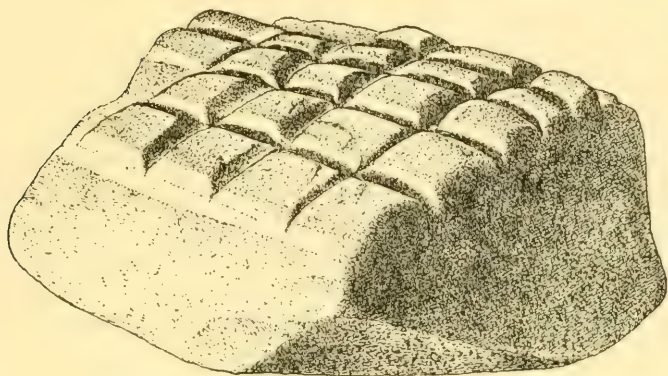


FIG. 38.—Incised fragment of sandstone.

well have settled at partially vacated Pueblo del Arroyo and been responsible not only for construction of Kiva B but also for conversion of the ventilating systems in F, G, H, and I. Both types of ventilators, shallow recesses in the bench and deep recesses above bench level, sipapus and no sipapus, occur in Bc 51, a small-house Chaco ruin (Kluckhohn and Reiter, 1939).

IV. EXTRAMURAL STRUCTURES

An entirely unexpected discovery at the very beginning of our Pueblo del Arroyo excavations, in 1923, was a series of small rooms built against the south side of the ruin. We were clearing away the wreckage of collapsed upper walls, a preliminary to inauguration of our plan of operations, when we came upon the series (pl. 2, upper). There may be two or three more in the group but we were content to examine the first seven (fig. 2). With other unanticipated structures west of the village these seven merit special consideration because they obviously were not part of the original community.

For some unknown reason the architects of Pueblo del Arroyo designed an unusually long room, over 100 feet in length, in the outer tier of the south wing. Built of mud and sandstone and with no adequate strengthening device, the walls of that room began to settle outward even while under construction. Realizing their mistake and seeking to correct it as expeditiously as possible, the builders hastily provided eight or more external buttresses. We know these to have been early improvisations because each abuts the outward-sloping wall and agrees with its type of masonry; and each stands upon a relatively shallow accumulation of constructional waste—the stone spalls and mortar droppings that are the usual accompaniment of wall building.

Although they differ somewhat, the eight buttresses we uncovered average 45 inches long, 15 inches wide, and 57 inches high. Increasing their length and height and joining their outer ends to form a succession of small rooms was a perfectly natural thing to do, the advantageous utilization of readymade features, present and conveniently spaced. But the added stonework stands in marked contrast to that of the buttresses. It is narrower and it consists of chance blocks of sandstone, often unshaped, rarely coursed, and laid in quantities of mud mortar—a haphazard sort of masonry that indicates a non-Chaco training. Nevertheless, adequately roofed, those seven improvised dwellings provided homes for several families—homes probably in no wise inferior to those the families had previously occupied.

THE SOUTH ANNEX

Despite the fact that their dimensions and fittings are recorded in Appendixes B and C, I desire briefly to direct attention to these seven

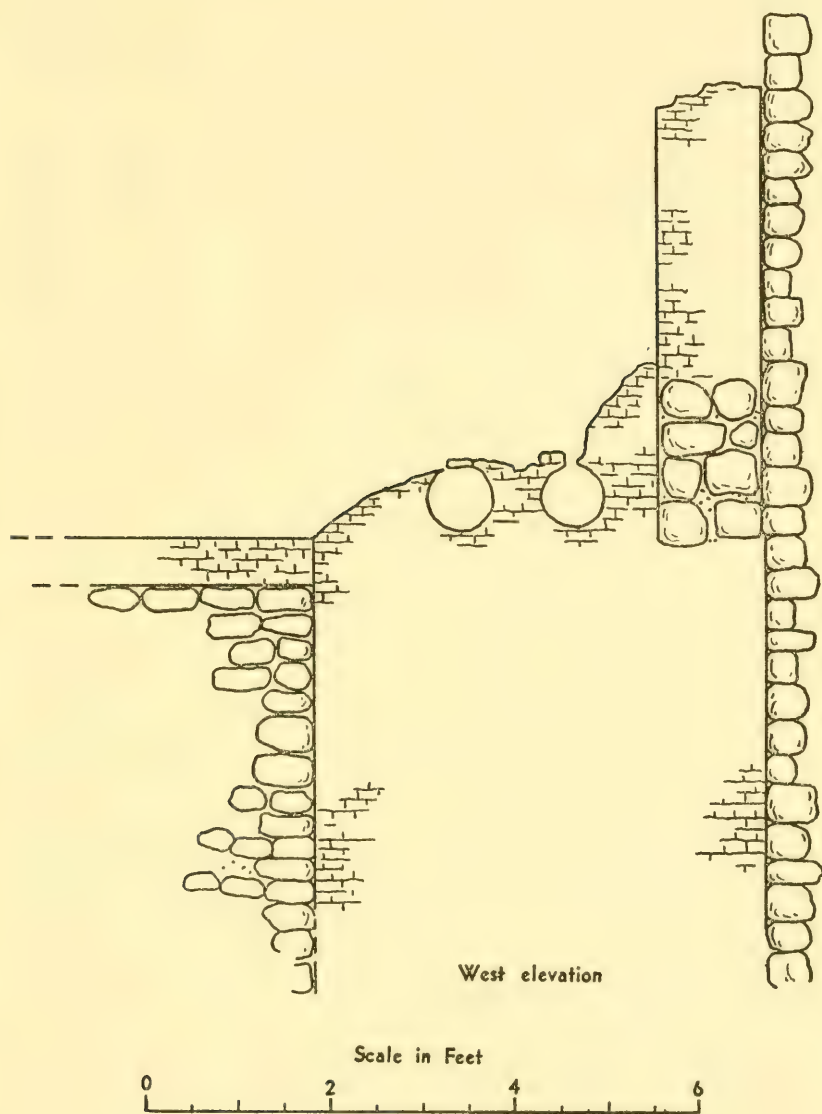


FIG. 39.—Alterations at northwest corner of Kiva I enclosure.

rooms, both individually and as a group (pl. 2, lower). In floor area they average about 56 square feet; in ceiling height, 5 feet 3 inches. In each instance the principal beam or beams lay north and south and had been seated in the buttressed wall by breaking out proportionate sections of its masonry veneer. Three beams were utilized in Room 1; one only in the other six.

Ceiling construction was most clearly illustrated in Room 2. Here a single main beam, fitted into the north wall 4 feet 5 inches above the floor, carried 5 secondary east-west timbers. These latter averaged 4 inches in diameter and, with lesser poles between, presumably had supported a layer of brush or cedar shakes and several inches of adobe. We took sections from the more promising of the five but, to our disappointment, their annual growth rings were too uniform for successful dating. Logs of comparable size had been inserted longitudinally into the ends of the buttresses on either side of the room and embedded in the added stonework to serve as wall plates for the southernmost timbers. Posts as beam props near the weak south wall were noted in Rooms 2 and 4.

The masonry necessary to complete the seven rooms was, in each instance, appreciably thinner and less substantial than that of the buttresses. While these latter vary in thickness from 12 to 18 inches, the added stonework averages only 10.

In preparation for Room 7, the 10-inch layer of constructional waste that had accumulated here was first removed. Then the face of that debris as it underlay the two buttresses was concealed by a coat of wall plaster that covered the buttress masonry and continued down to round off with the adobe floor. For Room 3 a deeper excavation was made since here the floor is 21 inches below ground level. The individuality of these seven dwellings is further indicated by the fact that the 3-inch-wide ledge marking floor level in second-story Rooms 9B-I to 9B-III, next on the north, is 7 feet 3 inches above the floor of Room 1, 7 feet 7 inches above that in Room 2, but only 6 feet 4 inches above the flooring in Room 4 which had been spread directly upon the constructional debris.

Mud plaster still adheres to wall masonry in five of the seven rooms, and this plaster is noticeably smoke stained in three of them, Rooms 5, 6, and 7. Small closets or niches, plastered inside, appear in the north and east walls, respectively, of Rooms 4 and 5 (pl. 48, left). Fireplaces are present in all rooms except 2 and 4. Three of these fireplaces are slab lined; one is lined with clay, and the fifth, with a combination of masonry and slab fragments on edge.

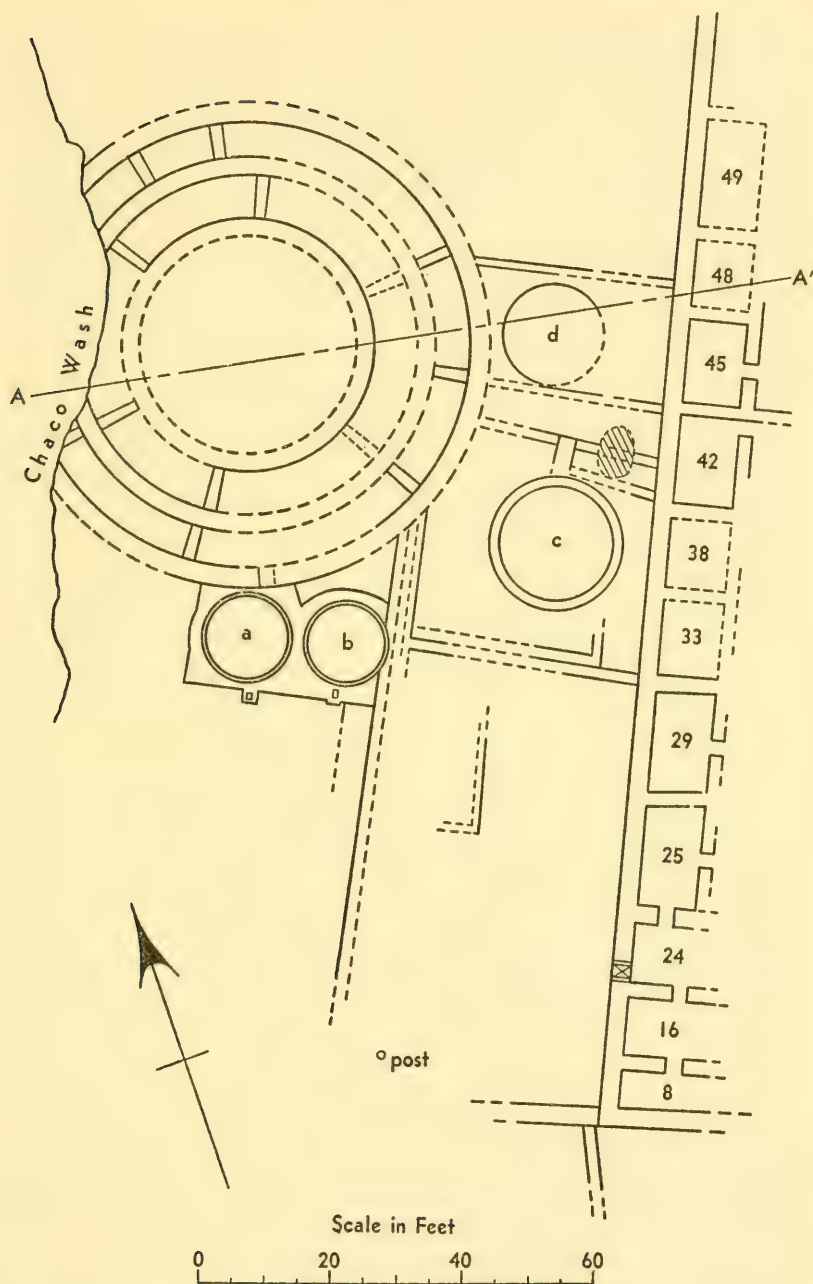


FIG. 40.—The McElmo Tower and adjacent structures. (From the original survey by Oscar B. Walsh.)

The fireplace in Room 3 is situated in the northwest corner; it is lined with slab fragments and was packed with wood ash when found. In the southwest corner of the room a neatly constructed ventilator, $6\frac{1}{2}$ inches wide by 19 high and 6 inches above the floor, opens through the south wall to connect with an external, masonry-lined shaft 15 inches deep. The top of this shaft, at ground level, was capped by an inverted metate that had been worn through and the resultant hole subsequently enlarged to an oval $7\frac{1}{2}$ by 12 inches (pl. 50, B). Within the room, against the west wall and midway between ventilator and fireplace, is a deflector that consists of a thin sandstone slab on end augmented by a discarded metate braced at the back by two slab fragments embedded in the floor (pl. 46, B).

A rectangular fireplace occupies the middle floor of Room 1, and a few inches distant two slightly worn tabular metates on end formed a protecting screen. This latter was required to deflect drafts created by the north door and an improvised ventilator, a small irregular hole broken through the south wall at floor level.

In Room 5 sandstone slabs formed a bin against the south wall to enclose a very un-Chaco-like metate (pl. 48, right). The mill has a flat over-all grinding surface 8 inches wide by 19 inches long and was accompanied by a sandstone mano measuring 7 by 4 inches. The lower end of the mill rested 2 inches below floor level while the raised end, where the miller knelt, was $5\frac{1}{2}$ inches above.

Interior doors connected Rooms 4 and 5 and, at one time, 5 and 6. The former, with a sill height of only 20 inches on its Room 4 side, was provided with a step formed by a rounded mass of adobe 5 inches wide and 20 inches long. Also, the door had been reduced to a width of 17 inches when secondary adobe jambs were added to receive a doorslab positioned from Room 5. The floor in Room 5 is 2 inches above that in 4. Outside doors had originally been provided for Rooms 4 and 6, but that in 6 was subsequently sealed. Entrance to the other five rooms, therefore, must have been through ceiling hatchways.

Part of a hatchway was noted in Room 3 where several of the ceiling timbers had survived. The opening was situated directly above the deflector that stands at the west end of the room, halfway between fireplace and ventilator. Here one of the secondary east-west timbers, 22 inches from the south wall, marked the north edge of the passage, and a pair of 2-inch-diameter poles extending from the timber to the southwest corner formed its west margin. Two similar poles, upon and at right angles to the first pair, suggest both the thickness of the

ceiling construction and the depth of the hatchway frame. There was no other means of entering or leaving Room 3. Presence of this opening could have had no relationship to the fact that the ceiling was 4 inches lower along its south side.

Room 2 lies between 3 and 1, and potsherds as well as sandstone chips were used in chinking its outside wall. Several of its lesser ceiling timbers continue through the west side and into Room 1—evidence that 2 was completed before the area of Room 1 was enclosed and roofed. Without lateral doors, Room 2 could have been entered only through its ceiling, but the location of the hatchway is not apparent in this instance. A main-beam seating in the north wall 9 feet 10 inches above the floor is that of a second story whose ceiling height we estimate at 5 feet. Portions of plastered second-story masonry still stand on both the east and west sides, and in the former there remains one jamb of a door that had opened upon the flat roof of Room 3. A door from Room 9B-II likewise gave access to the Room 3 roof. The flat roofs of Pueblo homes have always been utilized for fair-weather household activities.

Sometime after construction of Room 1 a passage had been broken through its north wall—the 33-inch-thick wall whose threatened collapse had prompted erection of the eight buttresses—to connect with Room 9A. At the opposite end of that exceptionally long room, before or after partitions were introduced to create Room 10, another door had been cut through. This provided a passageway from Room 10 to Room 7 or the site 7 now occupies. We know 7 was built later than Room 6 because the south half of its west wall abuts the outer southeast corner of 6. We believe the connecting door antedated construction of 7 because it had been neatly blocked with masonry of the same type as that on either side—close-fitting, laminate sandstone masonry for which the builders of Room 7 and its like had no patience. At the time of this blocking, a 24-inch-deep recess was left on the Room 10 side, and a substitute door, with steps, was opened immediately above—an awkward but effective example of replacement illustrated in our description of Room 10 (p. 15).

A noticeable feature in connection with Rooms 1-7 is their surprisingly low ceilings. Holes broken in the north-wall masonry for reception of their main beams vary in height above the floor from 4 feet 5 inches (Room 2) to 5 feet 6 inches (Room 7). Assuming these beams to have been 6 to 8 inches in diameter, we may estimate ceiling heights for the series at from about 5 feet to a little over 6. The adult occupants must have moved habitually in a stooped position

when indoors. Above roof level the butt ends of great 11-inch beams extend through from Rooms 8-11 to end flush with the outside wall.

Kiva B (fig. 41).—Raised above Room 1 at the west end of this annexed group, and likewise built against the outer south wall of Pueblo del Arroyo, is a small ceremonial chamber. We designated it "Kiva B" because it was the first of its kind we happened upon at this site and "A" was being reserved for a Great Kiva we anticipated

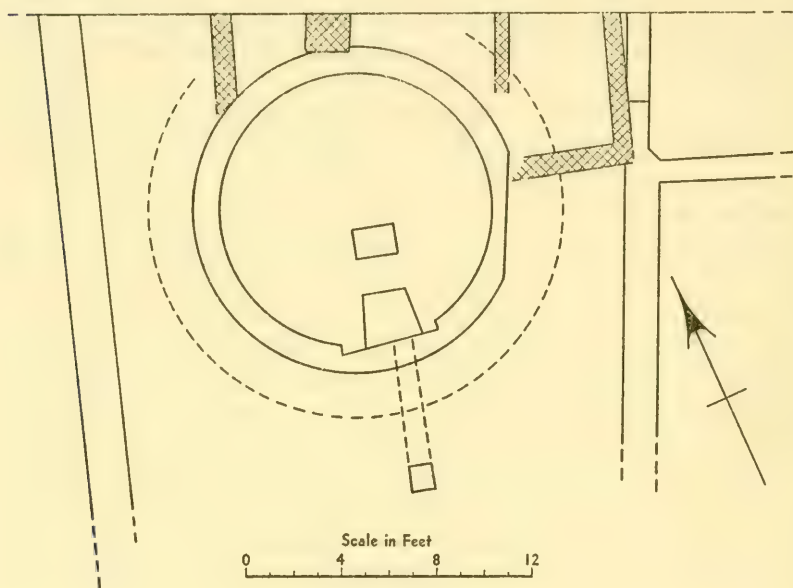


FIG. 41.—Kiva B.

within the pueblo but never actually sought. Kiva B is circular and it had been enclosed by straight masonry walls to effect the subterranean positions required of Chaco Canyon kivas, but otherwise it is as un-Chaco-like as the house group with which it is associated. Like that in the houses, its masonry is a haphazard composition of both laminate and friable sandstone, worked and unworked (pl. 45, lower). Remnants of its enclosing square survive on either side, but the south wall presumably was undercut and lost with enlargement of Jackson's "old arroyo" (pl. 44, B; see also Introduction, p. 2).

Kiva B is $11\frac{1}{2}$ feet in diameter at the floor. Encircling the floor is an earthen bench that averages 12 inches wide and 34 inches high. Above bench level the kiva is masonry lined, but the bench itself is entirely of earth except at the south recess. Clearly the bench was left when the kiva pit was dug down into the canyon alluvium. Sooted

plaster adheres both to the stonework of the upper wall and to the bare earth of the bench.

There are no pilasters in Kiva B. Its flat roof was supported by beams extending across from wall to wall at a height of 7 feet 9 inches. An empty beam socket may be seen below and to the right of the seated figure in plate 45, lower. At approximately waist level of this same figure paired ceiling beams from Room 8 end flush with the wall's exterior, a few inches below the ledge that identifies floor level in second-story Room 8B-I. That ledge lies $10\frac{1}{2}$ feet above the kiva floor and, as previously noted, 7 feet 3 inches above the floor in Room 1, adjoining.

The masonry-lined south bench recess in Kiva B is 47 inches wide and 6 inches deep. In the middle of it, on the floor and abutting its rear wall, is a rude masonry platform 7 inches high, 29 inches long, 29 inches wide at the back and 24 inches in front. From the top of this platform a ventilator, 10 inches wide by 21 inches high, opens into an air duct or tunnel that extends southward 44 inches to meet a masonry-lined shaft. This latter is 14 inches square and presumably once rose to kiva roof level. The tunnel had been covered with small poles, split cedar, and a layer of sandstone slabs. That this roofing had collapsed at some time and been replaced is suggested by the misaligned stones above (pl. 49, B). The ventilator opening apparently was narrowed at the same time for, as rebuilt, it was not carefully centered in the recess wall. Through shaft and tunnel fresh air was drawn into the kiva as air heated by the midfloor fireplace escaped through the ceiling hatchway.

The fireplace is a stone-lined box, 16 by 20 inches, sunk 5 inches into the floor. Because a deflector is lacking I presume the 7-inch-high platform, 18 inches distant, in some way shielded the flame from ventilator drafts. The expected sipapu, between fireplace and north bench, was not discovered.

Built upon the Kiva B roof and against the outside of Room 8 are two wall fragments and a buttress (pl. 45, lower; fig. 41). The latter is square ended directly above the inside curve of the kiva, but the two fragments clearly represent one-time, roof-level enclosures: a small room at the northeast corner of the square and an alcove opposite. Close in the far corner of this alcove is a fireplace, 11 by 19 inches by 6 inches deep. Beneath the alcove floor and extending southward between the convex kiva curve and its enclosing wall is a long, narrow space that had been paved $4\frac{1}{2}$ feet below the level of the kiva ceiling and thereafter filled with household sweepings. From this

rubbish we tabulated 1,902 potsherds of which 99 were of types I described as "Old Bonitian" when discussing the material culture of Pueblo Bonito (Judd, 1954, p. 21) and 798 were "Late Bonitian." Of these latter 40 were decorated in straight-line oblique hachure, 196 were of a variety we called "Chaco-San Juan," and 562 were fragments of Corrugated-coil culinary ware.

The narrow space opposite, between the kiva and its east enclosing wall likewise had been intentionally filled with blown sand and debris of occupation. Here we recovered a single square-stemmed, side-notched arrowhead, a knife made from a flint flake, two bone awls, and a small needle (U.S.N.M. No. 334921). Also, a bone flaker for chipping arrowheads and knives, an oval, flat-bottomed but undrilled lignite button measuring $1\frac{5}{16}$ by 1 by $\frac{7}{16}$ inches, a handful of unworked lignite fragments, and a number of miscellaneous potsherds.

Kiva B itself was filled mostly with masonry fallen from the second and third stories of Room 8. Among this wreckage we found the customary assortment of potsherds, a bone awl, a couple of hammerstones, and a chert flake chipped on both edges for use as a knife. In addition there was a $\frac{5}{8}$ -inch-thick section of a globular concretion that may have been shaped as a jar cover but that had last served as a palette in the preparation of yellow paint (U.S.N.M. No. 334839) and a stone artifact whose like I have never seen in another collection from the Southwest. It is a discoidal made from a waterworn cobble of very hard reddish conglomeratic quartzite and its periphery reduced by pecking to a uniform $\frac{1}{2}$ -inch width—as beautifully symmetrical as any Chunkee stone ever found in Georgia. Ours measures $2\frac{7}{8}$ inches in diameter by $1\frac{5}{8}$ inches thick (pl. 40, *v*), and I am told, with considerable hesitation, that cobbles of similar composition might be found in the San Juan Mountains. Traces of fugitive red paint are to be seen on both faces.

Masonry toppled from the second and third stories of Rooms 9 and 10, plus the ever-present windblown sand of Chaco Canyon, likewise filled the seven deserted homes associated with Kiva B. None of these dwellings contained a recognizable trash pile but each sheltered a few artifacts, or fragments of artifacts, abandoned or overlooked on moving day. Room 6 held the fewest, two manos and four hammerstones; Room 3 the most. Here we found the following:

- 1 tubular bone bead, $\frac{1}{2}$ inch long
- 2 bone awls
- 1 discoidal potsherd, $1\frac{5}{8}$ inches diameter, edges beveled, 3 biconical drillings
- 1 metate, $12 \times 17 \times 3$ inches
- 2 manos and 2 fragments

- 1 manolike stone shaped on 3 edges but not used as a mano
- 1 hammerstone
- 1 small smoothing stone
- 2 corrugated pots (pl. 47, *c*, *d*)
- 1 coyote skull (field No. 88)
- 1 right half of a human upper jaw (field No. 89)

The last item, half an upper jaw found among fallen masonry about 18 inches above the floor, is of peculiar interest since the left half of the same jaw (field No. 92) was recovered a week later in Room 9. There is no means of direct communication between the two rooms, and I have no idea as to how the fragments became separated. They presumably belong to a disarticulated adult male skeleton (U.S.N.M. No. 327141), the major portion of which lay at the west end of 9.

The two culinary vessels from Room 3 (pl. 47, *c*, *d*) are thoroughly typical of the early phase of Pueblo III as it developed throughout the San Juan drainage. Each has the characteristic egg-shaped body, constricted neck, and outflaring rim, but the coils on *d* are narrower ($5\frac{1}{2}$ to the inch) and less boldly indented than those on *c*. Neither form nor workmanship fixes precisely the district in which these two were made, but there can be no doubt as regards the canteen illustrated on plate 28, *c*, restored from fragments recovered in Rooms 2 and 3. Its gray surface was smoothed and decorated with organic paint prior to polishing. The paint itself is mostly a smoky gray in color, without relief, and burnished in places by the polishing stone. Shape and a slightly concave base mark the vessel as of Pueblo III age; its decorative elements are familiar ones in southwestern Colorado and southeastern Utah where organic paint was favored in Pueblo III times.

I am less confident of my judgment as regards two bowls found crushed in Room 5 (pl. 47, *a*, *b*). The first, unslipped and inexpertly made, has a rim that is rounded in part, $\frac{3}{16}$ to $\frac{1}{4}$ inch thick, partially incurved, and irregularly ticked with carbon paint. Externally the vessel has been hand smoothed without entirely obliterating the structural coils. The second bowl is thinner, with a flattened, unornamented rim, a flattened bottom, and a decorative band of opposed rectangular scrolls, plus some solid fill-in, drawn in a blue-gray pigment that lacks the relief of a mineral paint but, nevertheless, exhibits the tendency of a low-grade mineral paint to rub off. Perhaps we have here one of those infrequent examples in which the two pigments were mixed. An occasional line extended past its rightful ending might reflect the carelessness of early Chaco (Transitional) potters, or simply lack of experience.

There is but little else in the way of cultural material from these seven outside rooms that merits description. Stone implements such as hammers, manos, and metates, and slab fragments were left in the rooms where they were found; bird and mammal bones and awl fragments were noted and discarded. A bone awl from Room 1 (U.S.N.M. No. 334922) is noteworthy because of its 9-inch length and the drilled hole at the butt. Like that shown on plate 37, *f*, it might have served as a dagger, although we lack evidence of such a weapon among the historic and prehistoric Pueblos.

In addition to fragments of the canteen (pl. 28, *c*), we found in Room 2 a thin red claystone pendant $\frac{7}{8}$ inch in diameter (U.S.N.M. No. 334749), a couple of squared sandstone slabs each $\frac{3}{8}$ inch thick but one measuring $10\frac{1}{2}$ by 12 inches and the other 14 by 15, and a cherty sandstone concretion $6\frac{1}{4}$ inches in diameter by $5\frac{1}{2}$ inches thick, unmodified except for an encircling groove at the waist. It is doubtless only fortuitous that this grooved concretion lay on the floor beside the unfinished ax shown in plate 41, *c*.

The binned metate in Room 5 (pl. 48, right) is foreign to Chaco Canyon. Its outstanding feature is a transversely flat, full-length, over-all grinding surface. On this type of mill a hand stone as wide as or wider than the grinding surface ordinarily would be employed, but in this particular instance the accompanying mano was only 7 inches long. Metates of this type, mounted in a bin, came into use as early as Pueblo II (Brew, 1946, p. 240). Thereafter they were favored in certain areas but not in all; they are the preferred type in Hopi homes today (Bartlett, 1933, p. 17). The type has been variously described but most frequently as "flat," although the grinding surface is invariably more or less concave longitudinally.

The one-end-open troughed metate was the prevailing type in Chaco Canyon. Here, while the B.M. III and P. I cultures survived, metates made from relatively thin slabs of sandstone predominated (Roberts, 1929, p. 132; Judd, 1924, p. 402, pl. 1, lower); those made from thicker slabs became the fashion later. Both varieties were found at Pueblo Bonito and the thinner I attribute to the P. II portion of the population (Judd, 1954, pp. 133-137).

Metate bins are known from only two rooms at Pueblo Bonito, 90 and 291, and in both instances they had been dismantled. Although Morris, excavating the "Annex" at Aztec Ruin (1924, pp. 235-236), expresses doubt that troughed metates were ever binned, circumstantial evidence from Pueblo Bonito points otherwise. In all our

digging there we found no trace of a metate, thick or thin, that was not troughed, and Pepper reports none.²

Within the main walls of Pueblo del Arroyo we likewise observed only two rooms equipped for milling, 41 and 55, and the bins in each also had been stripped of their respective metates. Here, again, as at Pueblo Bonito, we may not be positive that the missing mills were troughed, but of all those reported in our field notes and catalog cards only one is described as of the "flat" type with over-all grinding surface, the binned example in Room 5. Since this is the exception, it adds support to my conviction that Room 5 and its neighbors were built by outsiders. A second, dubious specimen, recorded from Room 23 and described in my notes as 16 inches long by 1 inch thick, 10½ inches wide at one end and 6 inches at the other, may be one our Zuñi installed in the Room 55 bin.

At Leyit Kin, a small Chaco Canyon village apparently occupied at the same time as the great pueblos, Bertha Dutton (1938, pp. 67-68) recovered 50 metates of which 5 were of the flat variety. From a second small-house site about a mile to the west, Hibben (1937, p. 90) reported 84 metates and metate fragments "all of a single type, the open end trough." In the same ruin a year later Woodbury (1939, p. 58) found 22 additional specimens, 5 with trough open at both ends and 1 "of the plain surface (slab) type" without trough. None was in a bin. Thus, by whatever adjective it is described, the transversely flat, longitudinally concave metate with over-all grinding surface is not a cultural trait of Pueblo del Arroyo, Pueblo Bonito, and other major Chaco Canyon pueblos, although it may occur infrequently in nearby contemporary small-house settlements.

As stated above, I believe Rooms 1-7 were built and occupied by immigrants to Chaco Canyon. Everything about them looks alien: careless masonry, small size and low ceilings, potsherd chinking in walls, the above-floor ventilator in Kiva B. The binned metate in Room 5 is not a local type, therefore its owner must have carried it on her back, along with other possessions, from a former home. There is nothing equally distinctive about the other artifacts recovered from these rooms although some of the potsherds might also be regarded as foreign. Potsherds were present in each room but not in rubbish-pile quantities. As a matter of fact, only 1,559 nonduplicating sherds were tabulated from the seven dwellings. Dr. Roberts will have more

² Woodbury (1954, p. 59) could not have known that the "flat metate" Pepper (1920, p. 295) noted in Room 90 was one of the thin, tabular, troughed variety, the kind previously described (*ibid.*, p. 90) as "the usual form."

to say about these fragments in his forthcoming monograph on the ceramic remains of Chaco Canyon, and I only anticipate his analysis by stating that, of the total, 67.6 percent belong in the four categories I employed at Pueblo Bonito to approximate the proportion of pottery manufactured by the Late Bonitians. One hundred sixty-three, or 10.4 percent, of the sherds were of the variety we called "Chaco-San Juan."

Human skeletal remains were uncovered in the two adjoining rooms, 3 and 4. Upon approximately a foot and a half of constructional debris or fallen masonry in the middle of Room 3 we found the right half of an adult upper jaw (field No. 89). The remainder of that same jaw (No. 92) was subsequently unearthed under like conditions in Room 9, and there is no direct connection between 9 and 3. In each case the fragment lay amidst broken stonework between 1 and 2 feet above the floor. There were no other human bones in Room 3, but in addition to the fragment mentioned we removed from the west end of Room 9 most of a disarticulated male skeleton (No. 91).

In the northeast corner of Room 4 windblown sand had collected to a depth of 4 inches before the body of an infant (field No. 90), wrapped in some sort of textile, was brought in and buried there, head to the west. More sand was carried in to cover the little bundle and to trail away in diminishing depth toward the west wall. The customary debris of reconstruction had been dumped in upon the blown sand, and among that debris, in the west half of the room, we found the mandibles of a second infant and two adults. Fallen masonry had thereafter collected wall high. Clearly Rooms 1-7 had been vacated while families still dwelt in the village proper, on the opposite side of the leaning wall against which 1-7 were built.

THE TRIPLE-WALLED TOWER AND ENVIRONS

When I first saw Pueblo del Arroyo, in June 1920, a broad pile of earth and rubble was banked up against the middle west side (pl. 43). It reached to the second-story ceiling level, yet no stonework showed through. Building stones strewed the surface, but these plainly had fallen from the upper, westernmost wall of the pueblo. Topping all were several heaps of more recently turned earth and rock, thrown out by unknown persons seeking archeological souvenirs. From the base of the mound a less conspicuous accumulation sloped away to merge with the valley floor.

At the west margin of this lesser accumulation, wall fragments exposed by caving of the arroyo bank appeared, as I mentally pro-

jected them, not only to underlie the larger mound but even Pueblo del Arroyo itself (pl. 44, A). It was the presence of these fragmentary walls, together with the possibility to which they seemed to point so clearly, that persuaded me to include Pueblo del Arroyo in my initial recommendations for a program of archeological investigation in Chaco Canyon (Judd, 1954, p. vii).³

Our studies at Pueblo Bonito were inaugurated in 1921; those at Pueblo del Arroyo, 2 years later. I had placed my chief assistant, Karl Ruppert, in complete charge. But it was midsummer of 1926, after he had completed scheduled excavations within the ruin, that Ruppert led his crew to the low mound on the west side. His first exploratory trenches cut through quantities of constructural debris—sandstone spalls and rock-impressed chunks of adobe mud—nothing more. Not until he dug down to the wall remnants in the arroyo bank did Ruppert find something tangible from which to proceed. There, abutting the masonry, was a packed clay surface easily followed. Tracing that floor north and east brought to light a third wall, the innermost wall of two concentric tiers of rooms encircling a central area (fig. 40). Here, incredibly, was a triple-walled McElmo Tower in Chaco Canyon!

Jackson (1878) and Holmes (1878), exploring southwestern Colorado and adjoining territory in 1874 and 1875, first described the McElmo country and its spectacular towers—circular and quadrangular, oval and D-shaped. Both men regarded the smaller and more numerous single-walled structures as possible lookouts; both recognized the D-shaped and circular towers with radiating rooms as more likely of religious than domiciliary function. Holmes, especially, was intrigued by those with multiple walls. He reports four double-walled towers on or near the Rio Mancos and one triple-walled tower at the headwaters of McElmo Creek.

This latter was considered unique. Its like had not been reported elsewhere. Fewkes (1916, p. 218, footnote 6), with understandable skepticism, even recorded his doubt as to the reality of such a building. To find a triple-walled tower in Chaco Canyon, therefore, was a surprise for which we were entirely unprepared.

When Ruppert realized the significance of his discovery he proceeded with customary skill and caution. The pavement he was fol-

³ Apparently one of these wall ends was visible in 1901, for Holsinger (MS., p. 51) reported "on the west of the building there was a large court or inclosure encompassed by a low broad wall." This was indicated on his amended Jackson plan (herein, fig. 45).

lowing was overlain by 3 feet of constructional debris—a conglomerate of adobe mortar, sandstone spalls, and sand wetted by storm waters and packed by time into an almost impenetrable mass. Pickaxes loosened every inch. As a further handicap, the tower had been almost completely razed; what remained was broken and disordered. Two tiers of rooms circled a central area but neither tier was complete. The innermost wall, more nearly razed than the other two, was traceable for the most part only on its convex side. The highest bit of masonry still standing, on the east, rose only 35 inches above its floor. Sporadic fragments averaged 30 inches thick and rested upon 21-inch-high foundations (pl. 51, upper).

Such masonry as survived consisted of salvaged building stones. Among these, blocks of dressed friable sandstone predominated. In some sections the blocks were laid in courses and chinked with bits of laminate sandstone; elsewhere, courses of friable sandstone alternated with equally thick bands composed of laminate sandstone tablets an inch or more through. We doubt that there was a deliberate attempt to imitate the masonry of Pueblo del Arroyo, but the use of salvaged building blocks unquestionably resulted in stonework resembling that in which the blocks were first employed.

The central room, 33 feet in diameter, was originally paved with sandstone slabs but most of these had been removed, leaving only an incomplete band at the outer edge and a broader segment in the north-west quarter. We detected no trace of a fireplace, deflector, or other feature. In contrast, the two encircling tiers had been floored with adobe. Floor level appeared quite uniform throughout and just 6 inches above the base of the Pueblo del Arroyo west-wall masonry, 63 feet from the center of the Tower.

Rooms in the outer tier, perhaps 10 in number, were of unequal length but averaged 6 feet wide; those in the inner tier averaged $6\frac{1}{2}$ feet in width. The only indication of a lateral passageway anywhere in the structure is the west jamb of an apparent door, sill 26 inches above the floor, in the outer south wall. That door, if ever used, must have been short lived, since from the opposite side it was blocked by the roof-level fill in the walled area enclosing Kivas "a" and "b."

We measured the over-all outside diameter of the Tower as 73 feet 3 inches. We doubt that it was ever completed; that its rooms were ever roofed. We believe the three concentric walls once stood considerably higher but were razed midway of their intended height. We observed no trace of wood, charred or otherwise, but demolition is

established by the quantities of broken wall adobe and sandstone spalls revealed by the excavation.

Holmes (1878, pp. 398-399) describes his triple-walled McElmo Tower as at the far side of a compact village situated on the edge of a mesa overlooking a shallow valley. Its diameters approximated those of "the great tower of the Rio Mancos," 25 feet inside and 43 feet over-all; maximum height of standing walls is given as 12 feet. There were 14 apartments about 5 feet wide in the outer tier; fallen masonry filled the inner circle and concealed its partitions, if any. The third and innermost wall was neither as thick nor as high as the other two and, for this reason, Holmes assumed it to be that of a kiva. Walls still 12 feet high after several hundred years evidence at least a second story.

The stone towers of McElmo Creek and its tributaries, of the Rio Mancos and the upper San Juan, have awakened the interest and curiosity of at least three generations of archeologists, and the purpose for which they were built is still obscure. Jackson and Holmes supposed the single-walled structures to have been connected with the defense of nearby communities; those of more complex construction to have been associated with ceremonial practices. Schulman (1950) summarizes a considerable body of fieldwork since Holmes and Jackson, but finds nothing to corroborate or deny their early surmise. He passes over the double- and triple-walled towers which are our sole interest at the moment.

Holmes's great tower on the upper McElmo has never been excavated so far as I know. He gives its over-all diameter as 43 feet. The triple-walled structure back of Pueblo del Arroyo, partially built and then demolished, measured 73 feet 3 inches. Holmes, with time for examination limited, gives few constructional details, and our information is equally meager. Data are not yet available for a third triple-walled tower, recently discovered near Aztec, N. Mex., midway between McElmo Creek and Chaco Canyon. Architecture identifies all three as of Pueblo III age, and a note in *American Antiquity* (vol. 20, No. 1, p. 96) reports that Gordon R. Vivian, repairing the one at Aztec for the National Park Service in the fall of 1953, found earlier Pueblo III remains underneath.

Architecture and pottery together identify the canyon-head ruins of the McElmo-Yellowjacket-Hovenweep area (Morley, 1908; Morley and Kidder, 1917; Fewkes, 1916, 1918, 1925; Kidder, 1924, p. 65) more specifically with the distinctive Mesa Verde culture, a phase of Pueblo III civilization that culminated in the justly famous cliff

dwelling of what is now the Mesa Verde National Park, Colorado. Recorded tree-ring dates from those cliff dwellings lie between A. D. 958 and 1273 (Smiley, 1951, p. 23). We found no scrap of wood in our triple-walled Chaco Canyon Tower, but 35 constructional timbers from nearby Pueblo del Arroyo were felled in the 66-year bracket A. D. 1052-1117 (*ibid.*, p. 19). Since floor level in our Tower is only 6 inches above that in the pueblo we may assume that the latter antedated the Tower by a relatively brief interval.

There can be no doubt but that the double- and triple-walled towers, with their concentric circles and radiating rooms, are related to the Great Kiva of late Pueblo III times as Morris (1921, p. 138) pointed out long ago. But no one has yet fathomed the nature and extent of that relationship. We must await future studies in Holmes's triple-walled tower on the upper McElmo and in the newly discovered example at Aztec. Ours at Pueblo del Arroyo provided few helpful data and no artifacts.

Between the Tower and the west side of del Arroyo are two kivas, almost wholly razed, each within a partially demolished rectangle. We cleared the area to what I regarded as a safe, protective level and, in the process, exposed a number of other walls, or sections of walls, the significance of which was not always apparent. Doubtless we missed still others, but all those actually uncovered, like the great Tower, had been built with reclaimed rock, chiefly dressed blocks of friable sandstone, and all had been razed to the last few courses. South of the Tower are two more kivas, and I shall present the four in the order in which they were excavated.

Kiva "a" (fig. 42) averages 12 feet 5 inches in diameter at the floor; its bench averages 6½ inches wide and 22 inches high. Both the bench and the wall above were constructed of fairly large sandstone blocks, shaped and unshaped, irregularly and unevenly coursed, heavily plastered and sooted. There were no pilasters; no south recess. At the time of excavation the main wall rose 3½ feet above the bench at the northeast but only 2 feet at the west.

The ventilator outlet, in the south bench with sill at floor level, is 10 inches wide by 12 inches high; lintel poles support the masonry above. The tunnel extends S. 2° E. 23 inches to connect with a 10-inch-square shaft that rises 22 inches above the level of the kiva floor and opens upon a pavement outside the enclosing wall.

An irregular, clay-lined fireplace 25 inches in diameter and 7 inches deep lies 4½ feet north of the ventilator; it contained four sandstone firedogs and was filled with wood ash. The fireplace had been built

above the southwest corner of a masonry-lined pit, 53 inches east-west by 31 inches by 17½ inches deep, previously filled with constructional waste and floored over. Although the fill included neither ash nor charcoal, the pit walls and floor were more or less reddened from fires. There was no deflector between ventilator and fireplace.

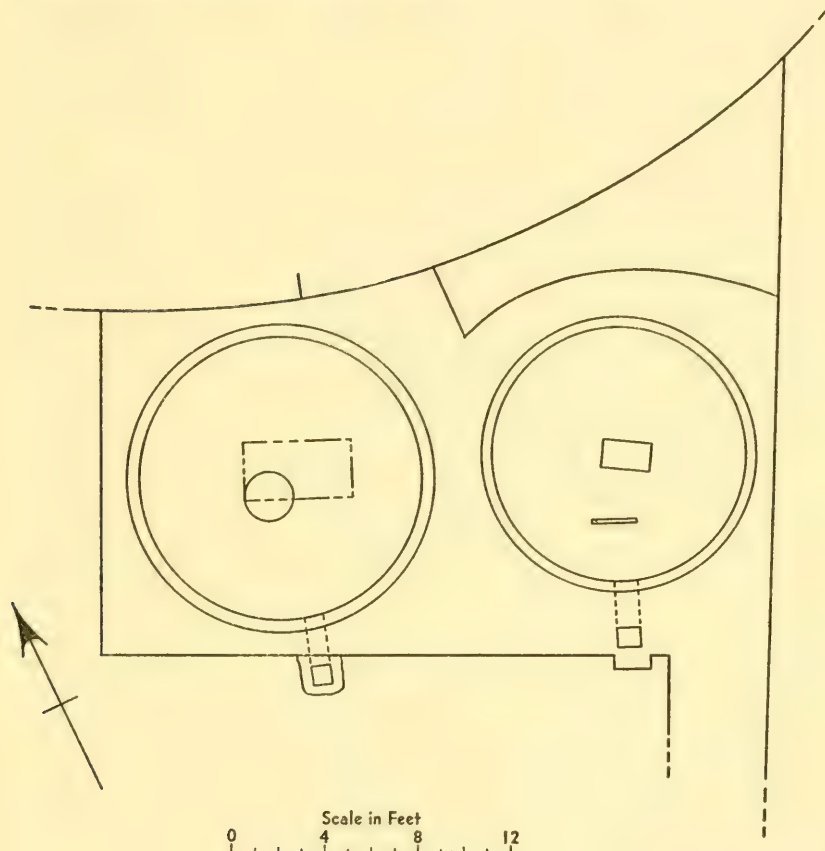


FIG. 42.—Kivas "a" and "b."

The Kiva "a" floor is 2½ inches above that in the Tower, but the west side of the enclosing square abuts the Tower masonry 35 inches above its base. At the time of excavation Kiva "a" was filled with blown sand and rubble from its razed walls. In this we found nothing but a handful of late-type potsherds and the broken earthenware pipe illustrated by figure 44. Its bowl is ⅝ inch deep. The three longitudinal punctate zigzags by way of ornamentation are reminiscent of an earlier culture, but here it is, associated with late Chaco sherds in the fill of a

non-Chaco kiva abutting the remains of a McElmo triple-walled Tower.

Kiva "b" lies immediately east of "a" and within the same enclosure. It averages 11 feet 7 inches in diameter at the floor; its upper wall had been razed to bench level. The bench, averaging 6 inches wide and 24 inches high, is of masonry that includes shaped and unshaped blocks of both friable and laminate sandstone, heavily plastered and smoke stained. As in "a," there are no pilasters and no south recess. The floor is 13 inches above that in Kiva "a" and 16 inches above that in the Tower.

A ventilator at floor level was recessed 1 inch to receive a neatly fitted sandstone slab measuring $13\frac{1}{2}$ by $15\frac{1}{2}$ inches by $\frac{3}{4}$ inch thick (found on floor fronting outlet). It opens into a 12-by-13-inch tunnel that is roofed with small poles and extends S. 10° W. 24 inches to connect with an 11-by-12-inch masonry shaft the outside of which stands 5 inches beyond the enclosing wall. A Pueblo II metate $1\frac{1}{2}$ inches thick, mano groove to the south, stands embedded in the kiva floor $29\frac{1}{2}$ inches from the ventilators and forms a fireplace screen 20 inches wide by $17\frac{1}{2}$ inches high (pl. 51, lower). Slab fragments wedged in at either side provided basal support. A rectangular, clay-lined fireplace lies $22\frac{1}{2}$ inches north of the deflector and, like that in "a," it contained four sandstone firedogs and was filled with wood ash.

In the corner between Kiva "b" and the Tower is an odd-shaped, doorless cell with its adobe floor 3 inches above that in the kiva and 19 inches above that in the adjacent Tower. The east wall of this corner room abutted the Tower masonry and was left standing free when the latter was razed. The fact that only the convex north wall is plastered suggests that our triple-walled Tower had been coated externally with mud at the time of construction.

Kiva "c" (fig. 43) lies between "b" and Pueblo del Arroyo and is surrounded by straight walls that form a generous enclosure. As in Kiva "b," the upper wall had been razed to bench level, but in this case the bench masonry had also been stripped away, leaving only its rough stone-and-adobe core. Nevertheless, we learned that the bench had been 19 inches wide and 26 inches high. Mud plaster $1\frac{3}{4}$ inches thick and representing successive resurfacings still adhered to a section of bench at the north side of the chamber. Kiva "c" averaged 17 feet 3 inches in diameter, and its floor, in contrast to those in "a" and "b," is $2\frac{1}{2}$ inches lower than that of the Tower.

A Chaco-type south recess, 8 feet 3 inches wide at the rear, interrupted the Kiva "c" bench for its full height and depth. Passing under the middle of this recess is a subfloor ventilator tunnel or duct 19

inches wide, masonry lined and roofed with small poles. It continues S. 19° W. 4 feet, there to connect with the air intake, a 16-by-17-inch masonry shaft. Since we did not clear the middle of the kiva,

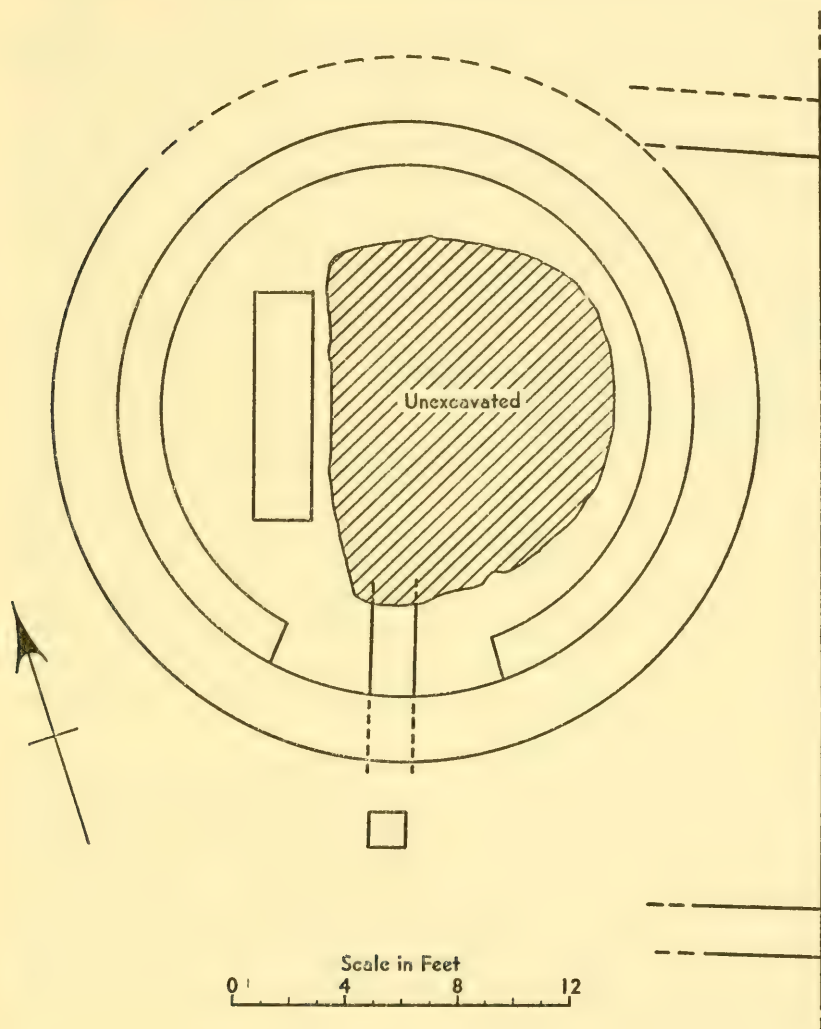


FIG. 43.—Kiva "c."

the total length of this duct and its depth were not ascertained. Neither did we uncover the customary fireplace and the deflector, if any.

On the west side of the kiva is a subfloor vault, 8 feet 1 inch long, 25 inches wide, and 14 inches deep (pl. 50, A). Its north, west, and

south sides are lined with clay but the east side is a masonry composite—laminated sandstone of fairly uniform thickness in the lower courses but larger blocks of friable sandstone, both shaped and unshaped, above. Paralleling the west side at a distance of 7 inches and extending 16 inches beyond each end is the impression of a slender pole and, directly beneath it, the clay-filled imprint of its predecessor. At each end of the vault is a sort of border, 15 inches north-south, bearing the imprints of unpeeled willows, split cedar, and cedar bark. These imprints curve upward slightly at the west as though the materials that caused them had once rested upon the lower pole. There is no corresponding pole impression on the east side, and although the "border" at the south end extends 4 inches to either side of the vault, that at the north extends to the west only.

In no other Chaco kiva did we find equally conspicuous imprints about one of the puzzling subfloor vaults. As we interpreted the evidence here, this particular example had been roofed at floor level with the materials customarily employed in house ceilings—excepting only the supporting poles which may not have been considered necessary in bridging a 2-foot space. But imprints of the supposed covering occur at the vault ends only, not along the sides. The original pole on the west edge had been removed and its impression packed with mud to cushion a substitute. The new pole rested directly above the imprint of the old one. Then a new floor was laid, at least from bench to vault, rising 2 inches to top the substitute pole and the north-end "border." A well-turned hematite cylinder (U.S.N.M. No. 334781), $\frac{1}{2}$ inch in diameter by $1\frac{3}{8}$ inches long, lay at the north end of the upper pole imprint.

Unlike the majority of kiva vaults cleared in the course of our Chaco Canyon investigations, that in "c" had not been filled and floored over while the kiva continued in use. In this particular instance the vault apparently served its unknown purpose until demolition was ordered, at which time its covering was removed and wreckage from the razed walls was allowed to fill kiva and vault indiscriminately. In the vault fill we found several large sherds of an olla decorated in Late Hachure and the burned abrading stone shown in plate 40, s.

Kiva "d" lies north of "c" and within walls that abut both the McElmo Tower and the west side of Pueblo del Arroyo. It had been more nearly demolished than the three already described. Its main wall and the bench, if any, had been completely razed on the east and south, to within 10 inches of its floor on the west, and to within

18 inches on the north. We detected no trace of a south recess. A floor diameter of 15 feet 3 inches is indicated.

The priestly builders of Kiva "d" apparently had difficulty in deciding just what they wanted. The floor is of packed sand with a minimum of binding clay, rounding off with the wall plaster and blackened through use. We counted only two layers of this plaster, an initial $\frac{1}{4}$ -inch spread directly upon the stonework and a second thin finishing wash of whitened clay. On the sandy floor, which is 5 feet 7 inches above that in the central room of the Tower, we found no fireplace although a small quantity of wood ash was scattered over the middle of it.

Constructional indecision seems indicated because the kiva masonry continues 4 feet 5 inches below floor level with apparent work surfaces at depths of 5 inches and 4 feet 2 inches, respectively. The lower of these two surfaces is in-

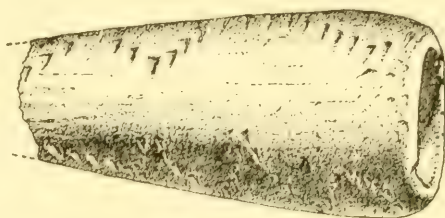


FIG. 44.—Clay pipe fragment.

distinct and uneven; the upper, less irregular and firmly packed. Each is overlain by a purposeful fill of clean sand. From top to bottom the masonry consists of dressed blocks of friable sandstone often somewhat angular in shape. Absence of laminate sandstone is particularly noticeable. Wall plaster does not extend to either of these work surfaces.

Kiva "d" is enclosed on the north and south by straight walls that abut both the Tower and the pueblo. The north enclosing wall, standing upon a 6-inch foundation of large, irregular blocks of friable sandstone, abuts the Tower masonry 25 inches above its foundation and the west wall of Pueblo del Arroyo 22 inches above its base. Here, 143 feet 8 inches from the northwest corner of the pueblo, the abutting wall had been completely razed, leaving only its foundation. Broken masonry above the union suggests that the former enclosing wall had been tied into that of the pueblo. At the other end of this east-west wall, 25 inches above the Tower foundation, a pavement extends floorlike to the north and east.

The opposite enclosing wall, 17 feet distant and razed to within 14 inches of its foot-high foundation, abuts the pueblo masonry 31 inches above its foundation. Seven feet beyond is the 16-inch-thick north wall of the Kiva "c" enclosure and, 3 feet farther, a

shorter parallel wall, 22 inches thick. The latter stands 2 feet higher than the first, but both were erected with reclaimed building stones and both about the plastered exterior of the pueblo.

By themselves these two examples of rather rude construction would excite little interest, but what we cannot comprehend is a mass of solid rubble—chunks of sandstone in adobe mud— $3\frac{1}{2}$ feet from the pueblo, standing on the same level as the two rude walls and overlying both of them. This feature, in its present condition, defies explanation. Between and above the two walls and, again, north of the first, stones have been pried from the pueblo wall as though to tie in other stonework at a higher level (pl. 52, A). North and south from this puzzling assemblage lay a thick blanket of constructional debris or, more likely, waste from the razing of these four small kivas and their enclosing walls (pl. 52, B).

The reader will have noticed that not only the triple-walled Tower but the four kivas and their individual enclosures were all built of reclaimed building stones and that all were subsequently demolished. Although some allowance must be made for distance, the Tower appears to have been erected first, for its central pavement is only 6 inches above the Pueblo del Arroyo west-wall foundation while the kiva floors, with one exception, are higher and, their enclosing walls higher still. Kiva "c," the only one of the four with Chaco features, was floored $2\frac{1}{2}$ inches *lower* than the Tower. The one identifiable floor in Kiva "d" lies 5 feet 7 inches above the Tower floor but its associated masonry extends down to within 14 inches of that floor. There is no doubt in my mind that the four kivas and their enclosures were built after the Tower, but I cannot say all were razed at the same time, however plausible this may seem.

In exploring what remained of the Tower and its environs we found comparatively little in the way of cultural material. The Roberts-Amsden tabulation shows a preponderance of Chaco-San Juan sherds from the Tower trenches and a high proportion of Mesa Verde black-on-white. A number of miscellaneous artifacts were unearthed as we removed the accumulation between the Tower and the pueblo. Most of them came from a 40-foot space between the rubble pile northeast of Kiva "c" and a point opposite Room 49; all, apparently, had been discarded with floor sweepings. The following list will show the number and character of this material: 18 bone awls, including only 1 of bird bone; 10 tubular bone "beads," $\frac{7}{8}$ - $2\frac{1}{4}$ inches long; the blade fragment of a spatulate bone knife (U.S.N.M. No. 334930) and a dozen pieces of worked mammal bones; 5 chipped arrowheads, 3 of

them with square base and side notches; a former $\frac{3}{4}$ -grooved ax, re-grooved, broken, and used as a maul (pl. 41, *g*); a friable sandstone building block, smoothed on the face and incised with crossed lines (No. 334872); a sandstone disk 2 inches in diameter by $\frac{3}{16}$ inch thick and 3 disks $\frac{7}{8}$ -1 $\frac{7}{8}$ inches in diameter, made from potsherds; the neatly squared fragment of a fine-grained sandstone tablet $\frac{1}{4}$ inch thick with a half-inch circle gouged out at the corner (No. 334809); 8 fragments of human-effigy vessels, all but one decorated with mineral paint (pl. 36, A); 2 fragments of a double-bowl rectangular redware vessel, polished black in one half, red in the other (No. 334677); part of the handle from a Chaco-San Juan style ladle (fig. 23), and the miniature half-gourd ladle with broken handle shown on plate 27, *j*; and portions of several human skeletons (field No. 596). The articulated skeleton of an adult male or female (field No. 191; U.S.N.M. No. 327137) appeared to have been interred, without grave furniture, among the accumulated debris south of the Kiva "c" square.

Nearby but not immediately associated with this burial was a small fragment of an apocynum-fiber sandal (No. 334712) and part of a comblike bone object, concavo-convex in cross section and 2 $\frac{7}{8}$ inches long, with 5 "teeth" polished by friction on the underside (pl. 37, *e*). Farther south, outside Room 16 and 21 inches above its floor level, was a pile of burned timbers and burned debris of reconstruction, the clean-up after a fire somewhere in the village. Room 24 is not regarded as a likely source of the pile despite the fact that its east wall, with the ends of several charred ceiling poles still present, had been burned above a 33-inch-deep accumulation of collapsed masonry and blown sand. From this same general area, between Kiva "c" and the southwest corner of the pueblo, we collected 3,988 potsherds of which Roberts and Amsden tabulated 138 as Corrugated-coil culinary ware, 94 as Chaco-San Juan, and 12 as of Late Hachure. Only 31 were types that, at Pueblo Bonito, I would have listed as products of the Old Bonitians.

OUTLYING WALLS

Under this heading I desire briefly to consider two walls, one adjoining Pueblo del Arroyo and the other nearby. The first, presently standing 4 feet high against the outer southwest corner of Room 8, extended west an unknown distance before Jackson's "old arroyo" destroyed all but the easternmost 15 feet of it (pl. 45, upper). Abutting the south face of this remnant, but on a silty layer several inches

higher, is the west side of the Kiva B enclosure, likewise largely washed away by the "old arroyo" (pl. 44, B).

Following his 1877 examination of this ruin, W. H. Jackson (1878, p. 443) wrote: "The arroyo is undermining the soil close to the southwest corner of the pueblo, and has already exposed some old lines of masonry, which on the surface do not give any indications whatever of their existence." These are the "old walls" of his plan (herein, fig. 45), low walls buried under successive layers of valley alluvium during or following occupation of the village. Nothing is now visible of those walls except, possibly, a southward-extending section near the angle at the west end.

In 1897 or 1898 the Hyde Exploring Expedition built a boardinghouse for its employees a few yards from the southeastern corner of the pueblo and, nearby, prepared a dugway for its freight wagons across both the old and new watercourses. In his 1901 report to the Commissioner of the General Land Office, Holsinger (MS., p. 52; herein, fig. 45) "amends" Jackson's plan and approximates the locations of both the crossing and the boardinghouse but records nothing relative to Jackson's "old walls." Nevertheless, if these latter had been completely destroyed in the interval, memory of them persisted in 1911 when, following his visit to Chaco Canyon in the spring of that year, Huntington (1914, p. 82) wrote: "Three feet under the level of the main plain upon which stand the ruins of Pueblo del Arroyo traces of old walls can be seen extending 100 feet beyond the present ruins; the lowest part of these walls is 5 feet below the present surface." Elsewhere (Bryan, 1954, p. 33; Judd, 1954, p. 13) we have noted that 3 to 5 feet of Chaco Canyon alluvium not only buried walls and fields but threatened inundation of small outlying settlements.

I can conceive no logical purpose for a 2-foot-high straight and detached wall 100 feet long where Jackson placed it except as a means of diverting contemporary floodwaters away from the village. That may also have been the function of a now-buried wall that extends east from Pueblo Bonito nearly 200 feet. It does not apply, however, to a similar but still longer wall that stretches out across sand and rock from the northeast corner of Pueblo Alto, on the cliff north of Bonito.

The buried twelfth-century channel which Jackson saw exposed in the bank of the arroyo in 1877 passed to the south of his "old walls" and his "old arroyo," but north of them, in the side of a dug storage cellar back of the boardinghouse, Bryan (1954, p. 34) noted evidence of a lesser channel containing sherds of late types of Chaco Canyon pottery. The twelfth-century arroyo may not have seemed a menace

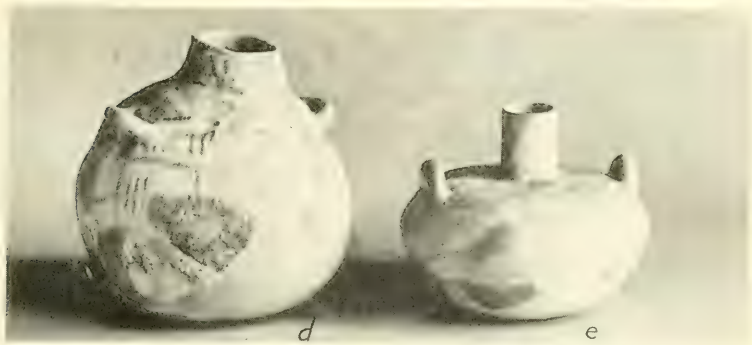
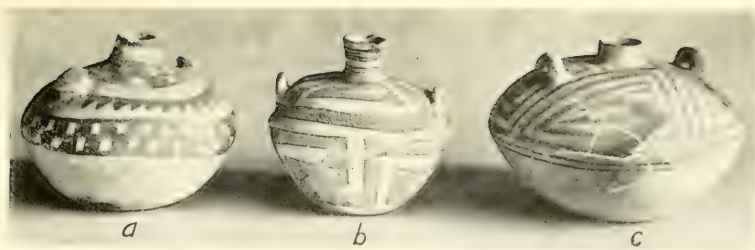


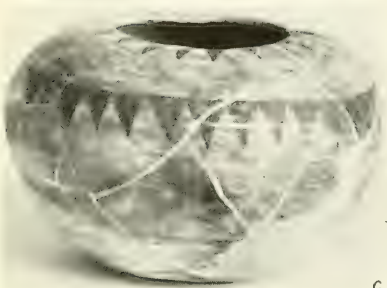
PLATE 28.—Canteens (*a-c*) and pitchers (*f-k*).



a



b



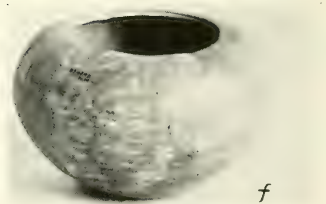
c



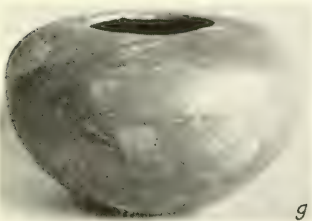
d



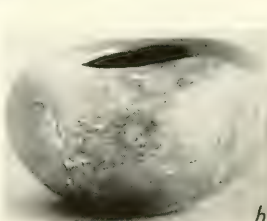
e



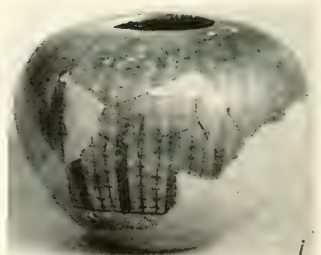
f



g



h



i

PLATE 29.—Seed jars.



a



b



c



d



e



f

PLATE 30.—Water jars.



a



b



c

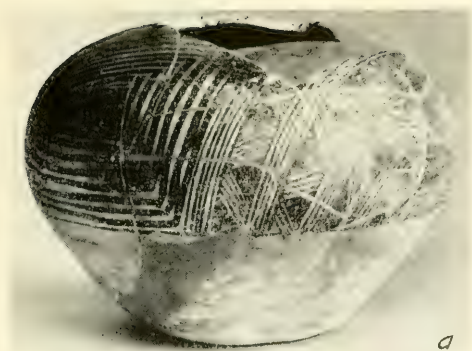


d



e

PLATE 31.—Ollas and storage jars.



a



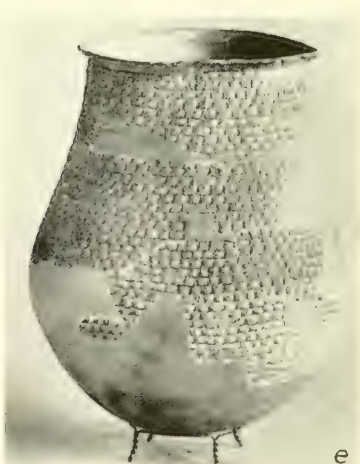
b



c



d



e

PLATE 32.—Small jars and Corrugated-coil culinary vessels.

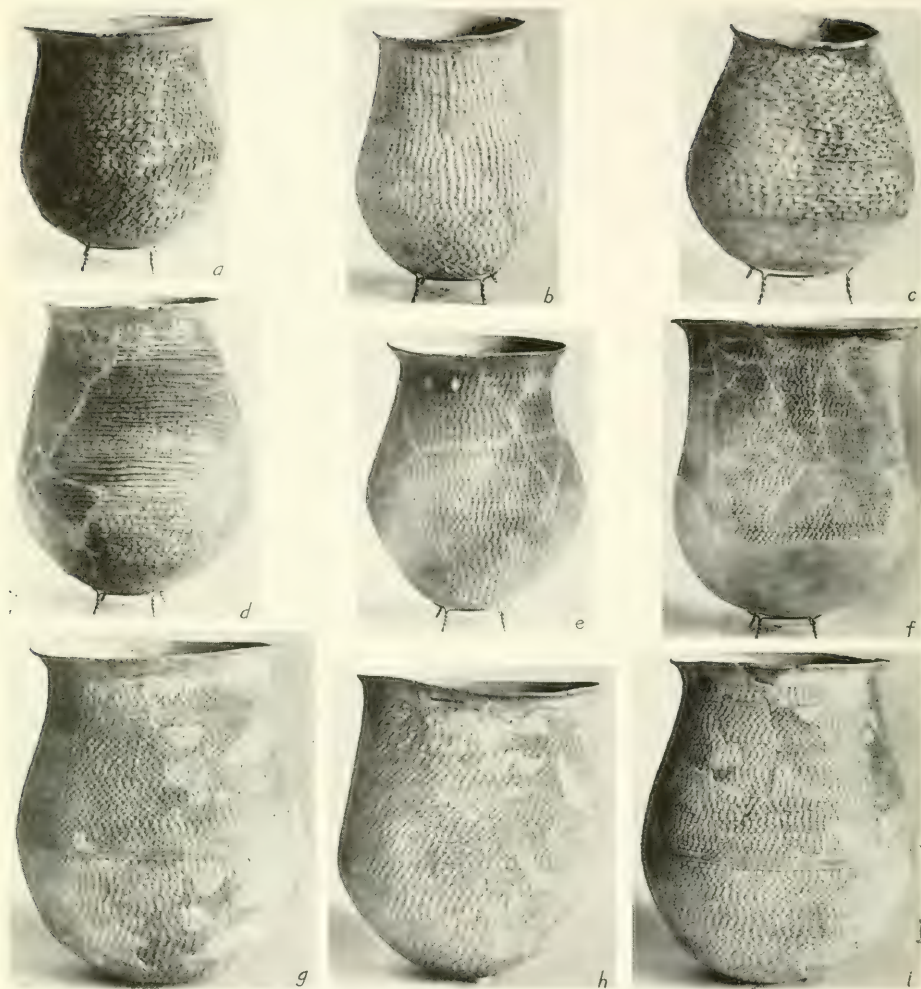


PLATE 33.—Corrugated-coil culinary ware from the upper fill in Room 65 (*a-f*) and from Room 27 (*g-i*).



PLATE 34.—Twelve Corrugated-coil culinary vessels stored on the floor of Room 65.



PLATE 35.—Earthenware representations of bifurcated baskets.

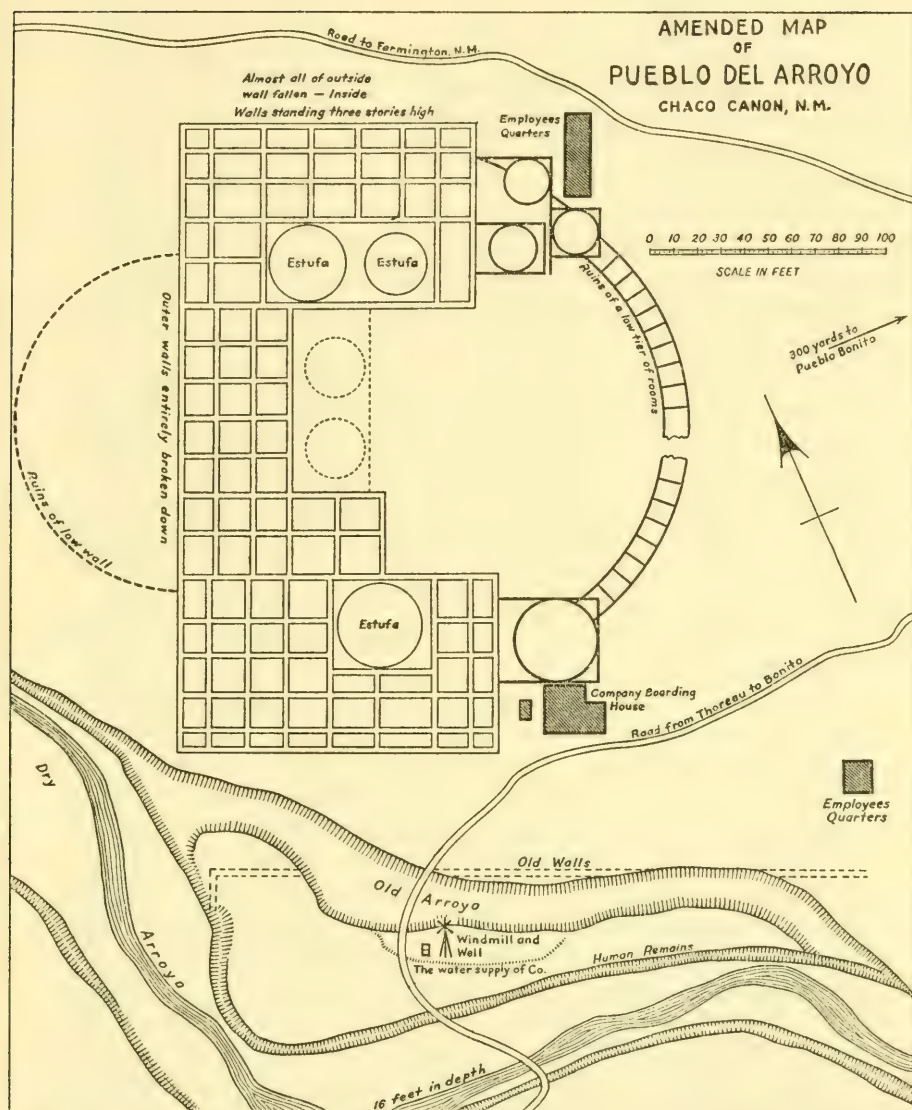


FIG. 45.—Jackson's 1877 plan of Pueblo del Arroyo as amended by Holsinger in 1901 (in heavier line).

to the residents of Pueblo del Arroyo, but they must have been annoyed, if not apprehensive, when layers of flood-deposited mud annually piled up against their village.

Three Hyde Expedition photographs, generously made available by Dr. Harry L. Shapiro, head curator of anthropology at the American Museum of Natural History, contribute a further note to our present subject (pl. 53, *a-c*). The lower shows the Chaco, in flood, cutting across the course of Jackson's "old arroyo." At the right in this view a conspicuous, mid-distance bank marks the border of the old channel. In a closer view (*b*) a layer of rubbish, apparently debris of reconstruction (the print identifies "pottery in the bank near Pueblo del Arroyo"), extends in varied depth to left and right. If I judge correctly, part of that same layer appears in the third photograph (*a*), beyond the bank and nearer the ruin. Although it approximates the position of Jackson's "old walls" it is my guess that that deposit represents part of the village trash pile, concealed beneath 3 or more feet of silt. At the time of our studies absence of a recognizable village dump was puzzling and led us to suppose it had been leveled and hauled away to provide space for the Hyde Expedition's boardinghouse. The normal place for a local village trash pile would have been south or southeast of the settlement. No portion of the 100-foot-long old wall was visible during the course of our explorations.

That some leveling and clearing up occurred hereabout may be assumed since the Hyde Expedition would naturally have been solicitous for the comfort of its employees and, later, of its guests after the boardinghouse had become the "hotel." Both Holsinger and Huntington stayed here, and the former was prompted by proximity of the ruin to do "a little prospecting with pick and shovel" (MS., p. 51). In the course of this activity he uncovered what he described as "a gateway" in the middle of the court-enclosing arc of one-story rooms. Holsinger's revision of Jackson's plan was not known to us until long after, but while searching here for room corners in preparation of our own ground plan we observed nothing to suggest an eastern entrance. However we did find, outside the arc of rooms, a slab-lined fireplace and a low angular wall without meaning to us; also, between the boardinghouse and the ruin, evidence of what may have been an outlying kiva, wholly or partially destroyed in the excavation for a modern cistern. The successive silt layers that had half buried the small Pueblo III ruin on the opposite side of the channel (pl. 53, *c*) continue to the south wall of Pueblo del Arroyo and around to the west (pl. 44, A).

V. MATERIALS FROM THE EXCAVATIONS

In Pueblo del Arroyo, as in other ruins long exposed to summer rains and winter snows, few perishable substances have survived. Windblown sand in greater or less amount had collected in every ground-floor room we opened—accumulations sometimes contemporary with occupancy of the village since household sweepings often overlay the sand. Many of the objects we recovered came from these sweepings but others clearly had fallen with collapse of second- and third-story floors.

In eight instances, Rooms 9, 10, 28, 39, 40, 43, 51, and 62, debris of occupation in appreciable quantity had been dumped in before the ceilings and masonry had crashed down from above. Rooms 14 and 46 had been briefly used as dumps, then refloored and reoccupied. Room 65 was a storeroom until its roof caved in; thereafter, a neighborhood dump. Burials had been made in the sand layer or in the overlying waste in Rooms 4, 13, and 40; portions of human skeletons dislodged elsewhere had been thrown in upon the accumulations in Rooms 3, 4, 9, 10, 11, 15, 16, 21, and 24, in Kivas H and I, and in the area of demolition west of the village. Together, burials and salvaged artifacts fail fully to illustrate either the inhabitants of Pueblo del Arroyo or their arts and crafts.

FOODSTUFFS AND CLOTHING

A few scraps of woven goods, a sackful of bird and mammal bones from kitchen rubbish, and a small selection of fruits from native plants are all we have to show what the local population ate and wore. If we were to complete the list, even in part, we should have to rely upon the published records of archeological research in contemporary ruins where a like culture prevailed, as Pueblo Bonito and Aztec Ruin.

Clothing was prepared from cotton, dogbane, yucca, and perhaps other vegetal fibers, and the tanned skins of mammals. A 3-inch square fragment of cotton cloth, plain-woven 30 threads to the inch (U.S.N.M. No. 334715) was found on the floor of Room 9B-II. A cotton blanket, of which we were able to save very little (No. 334716), had been wrapped about the body of an infant (field No. 90) buried in Room 4. A knotted 2-ply apocynum thread dyed red came from second-story Room 9B-I and short lengths of yucca cord of varied di-

anometer were recovered in Rooms 8B-I and 16A. We should have found, but did not, lengths of yucca-fiber cord intertwined with strips of fur or feathers to evidence the cold-weather blankets (doubling as bedding) used in Pueblo homes from prehistoric times until the close of the nineteenth century. Three scraps of unidentifiable mammal skin, tanned and tailored (U.S.N.M. No. 334721), also came from Room 8B-I.

Sandals are represented by four fragments only—two plaited of narrow strips of yucca leaves and two woven of dogbane fibers (*Apo-cynum* sp.). The larger of these two latter (No. 334714) is from the instep and measures approximately 5 inches long by $3\frac{1}{2}$ inches wide. On a foundation of 29 stiff, 3-fiber yucca warp threads it is woven with a 2-color bar-and-stepped-square design on the upper side and a raised pattern below. This fragment, likewise from the floor of second-story Room 8B-I, is the only evidence of cloth sandals with colored ornamentation unearthed during our seven summers in Chaco Canyon. The outline of a complete example, for the right foot, was drawn with chalky-white kaolin on the brown north-wall plaster of Room 44 (pl. 14, B).

Two pieces of sandals, twill plaited of narrow strips of yucca leaves in the familiar over-2-under-2 technique, were recovered from Room 8B-I (fig. 3) and Room 44A. Sandals such as these, with a notch on the outer edge at the little toe, doubtless were the favored footgear at Pueblo del Arroyo, although a coarser, notchless variety, braided with wide strips of the broad-leaved yucca (*Y. baccata*), was equally well known.

Ornaments.—The meager assortment of ornaments in our collection was recovered chiefly from household rubbish. Beads and pendants predominate, and most of them were fashioned from shells originating in the Gulf of California. The series is less diversified than that from Pueblo Bonito but includes no species not represented there. Of two "saucer-shaped" beads, both $\frac{3}{8}$ inch in diameter and cut from the wall of an olivella, one (field No. 303) is faced with a disk of jet and drilled transversely under the disk for stringing.

We have two beautifully polished jet pendants, both from Room 32 and somewhat heat blistered on the back. One is square with three rounded corners, and the other is triangular with all corners rounded (U.S.N.M. Nos. 334753-334754). The former, sawed from a thicker piece, had holes for a suspension cord drilled to meet below the surface behind its one squared angle. We have half of a discoidal red clay-stone pendant and three that are oblong, two of them undrilled. Sev-

eral fragments of calcite and selenite and a cube of galena bear abrasion scratches as though they had been considered momentarily as possible ornaments.

Turquoise was conspicuously lacking in Pueblo del Arroyo. We recovered only 15 discoidal beads and fragments, all from an offering in Pilaster 8, Kiva C, and only 16 whole and fragmentary pendants of which 13 came from various Kiva C pilasters. Of the other three, two are half an inch long or less while the third, found burned and broken in Room 41, represents a once magnificent specimen (fig. 8). In addition we have 10 small shaped pieces of turquoise, mostly tesserae (U.S.N.M. No. 334741), and a handful of chips from a lapidary's workbench in Room 24 (No. 334744).

Copper bells presumably were worn as personal ornaments. We recovered two small complete examples and fragments of three others, and of the five only one (U.S.N.M. No. 334766) came from a kiva, J. In addition, a piece of sheet copper $1\frac{5}{8}$ inches square was found in Kiva F (No. 334767). Three of the six specimens were included in our analysis of copper bells from Pueblo Bonito.⁴

Foodstuffs.—The remains of foodstuffs recovered during the course of our excavations are as scant as those of clothing. Seeds, rind fragments, and stems of the common pumpkin (*Cucurbita pepo*) were found in several rooms, but maize, or Indian corn (*Zea mays* Linn.), the staff of life here as elsewhere in the Plateau Province since the beginning of Pueblo history, was represented by a mere hatful of charred cobs from Room 65. Pinyon nut shells were noted among debris of occupation in three rooms, 43, 46, and 65; a thimbleful of prickly-pear seeds (*Opuntia* sp.) were found together in Room 44. Other fruit- or seed-bearing trees and shrubs, native grasses, and wild potatoes (*Solanum* sp.) likewise contributed their annual harvests as we know from findings in Pueblo Bonito. However, the cockleburrs (*Xanthium saccharatum* Wallr.) embedded in the wall masonry of Room 47 are believed to represent, not a possible food plant, but merely an annual annoyance to the women who mixed mud mortar with their bare feet.

The inhabitants of Pueblo del Arroyo were agriculturists and, as such, depended for their livelihood primarily upon plants cultivated in small garden plots. Nevertheless, they probably trapped ground squirrels, as Pueblo farmers still do, and hunted larger game when-

⁴ Except as otherwise indicated, references in the following pages to Pueblo Bonito material will be to data published in my report, *The material culture of Pueblo Bonito* (Judd, 1954).

ever opportunity offered. Animals, all or most of which presumably were eaten, were represented in local trash heaps by bones of the following species:

Mule deer (*Odocoileus hemionus*)
Pronghorn (*Antilocapra americana*)
Elk (*Cervus canadensis*)
Mountain sheep (*Ovis canadensis*)
Jack rabbit (*Lepus californicus*)
Cottontail (*Sylvilagus auduboni*)
Badger (*Taxidea taxus*)
Beaver (*Castor canadensis*)
Bobcat (*Lynx baileyi*)
Coyote (*Canis lestes*)
Indian dog (*Canis familiaris*)

Dogs and turkeys had been domesticated by the several Pueblo tribes long before advent of the Spaniards in 1540, but there is still doubt as to whether they were regularly eaten. The unknown author of the "Relación del Suceso," a member of the Coronado Expedition, observed (Winship, 1896, p. 573) that the Pueblos kept turkeys "more for their feathers than to eat, because they make long robes of them." Parsons (1939, p. 22) expressed surprise upon seeing Taos men eat turkey, since in villages south of Taos "turkey is a ritual bird, kept that its feathers may be used in prayer offerings; and it would not be eaten, people say, even in time of famine."

Hopi of the present century insist that they would not eat dog or coyote except to ward off starvation (Parsons, *ibid.*, p. 22) but Alexander M. Stephen (1936, pp. 266, 939), with no famine in prospect, saw two dogs killed and dressed for the table, one of them "a large, fat, young dog" that had broken a window pane while accidentally locked in one of the houses and therefore "deserved to be killed."

Birds presumably were kept or caught for their feathers, not to eat. Turkeys had been domesticated in P.I. times if not before, and thereafter strips of turkey feathers were twisted with yucca fibers to make winter blankets. We found bones of the wild turkey (*Meleagris gallopavo*) wherever household rubbish was thrown and, chroniclers of the Conquest period to the contrary (Winship, 1896, p. 573), I find it difficult to believe that pre-Spanish Pueblo peoples had not discovered the edibility of boiled breast of turkey.

Other than wild turkey, only the following species were recognized among our bird bones from Pueblo del Arroyo:

Macaw (*Ara macao*; *A. militaris*)
Prairie falcon (*Falco mexicanus*)
Raven (*Corvus corax*)
Red-tailed hawk (*Buteo borealis*)

Whether eaten or not, Indian dogs and coyotes were familiar sights at Pueblo del Arroyo as indicated by the following findings:

Room	Field No.	Description
3	88	Coyote, cranium only
11	..	Coyote skeleton, incomplete
20	..	Dog, puppy, incomplete skeleton
37	..	Dog, cranium only
Kiva C	..	Coyote and young dog, miscellaneous bones
Kiva F	484	Dog skeleton (on floor)
" "	485	Dog skeleton (on east side, bench level)
" "	486	Young dog, incomplete
Kiva I	487	Dog skeleton, cranium missing
" "	..	Dog skeleton (on east side)

These remains, divided between the Museum of Comparative Zoology, Cambridge, Mass., and the United States National Museum, were described by the late Glover M. Allen (1954).

Three articulated macaw skeletons (*Ara macao*, *A. militaris*, *A. sp.*) were found on a shallow accumulation of sand in Room 63 (U.S.N.M. Nos. 334950-334952), and an incomplete skeleton of the gorgeous red-blue-yellow macaw (*A. macao*) was recovered in Room 44. This latter find (field No. 312) is of more than usual interest because it provides evidence of an apparent clash of tempers. We may imagine a sudden painful bite from an irritated beak and a sharp, angry blow in retaliation. Landing full on the bird's breast, the blow resulted in permanent injury which A. Wetmore describes as follows: "The lower end in both coracoids has been fractured and then has healed in such a way as to bring complete fusion at the normal area of attachment to the sternum, as well as with the manubrial area. The free edge of the keel of the sternum also shows an old injury, being distorted to the side in subsequent healing." (Note: The coracoids were driven within the sternal apparatus; the keel distortion is due to lack of sunlight or calcium deficiency.)

The quill fragment of a turkey wing feather wrapped about with a length of coarse 2-ply yucca cord and the forward part of a blue feather, presumably macaw, lay on the floor of Room 9B-III (Nos. 334720-334722). An incomplete turkey skeleton came from Room 63. Captive macaws and eagles are to be seen occasionally in present-day Pueblo villages where there is a year-long need for their feathers on prayer offerings.

As a final possible item of food there was fish. There has never been a living stream in Chaco Canyon and there is no likely source of fish nearer than the San Juan River, 50 miles to the north, hence our astonishment when seven scales of the gar pike (*Lepisosteus sp.*,

U.S.N.M. No. 334958) were unearthed in Room 44. The gar pike has not been reported from the Rio San Juan but it is at home in the Rio Grande over 100 miles to the east.

BASKETRY

Basketry, of daily use in every household in Pueblo del Arroyo, is another material that could not withstand dampness. We noted several instances where baskets had left their imprint on muddy floors or in sandy accumulations but recovered only three small fragments. One of these is a $2\frac{1}{2}$ -inch-long piece embodying only three coils of a bowl woven in the well-known technique, 2-rod-and-bundle bunched foundation with uninterlocking stitches. The other two fragments, clearly from the same specimen, exhibit simple interlocked stitching on a 1-rod foundation. These three scraps thus represent only two of the many basketry techniques undoubtedly employed at Pueblo del Arroyo and only one of several vessel forms, the bowl.

Two earthenware effigies of the bifurcated carrying basket, which presumably served some religious function, were found in the second-story wreckage of Room 27 (pl. 35). Other examples of this unusual creation, together with remnants of burden baskets, cylindrical baskets, and other forms have been reported from nearby Pueblo Bonito (Pepper, 1920; Judd, 1954).

OBJECTS OF WOOD

The men of Pueblo del Arroyo were skillful workers in wood. Despite tools limited to stone axes, sandstone abraders, flint or obsidian knives, and wedges of some sort, the product of their industry merits our applause. Their methods of working wood were simple: chopping and sawing, scraping and rubbing.

Architectural wood includes beams and ceiling poles, lintels, posts, shakes, and planks. Beams were cut and peeled while green and carried to the building site. We saw none that had been scarred or chafed in transportation; none that had been felled by fire. The principal beams, often 10 or 11 inches in diameter, presumably were cut to the desired length either in the forest or at the building site, since the final axwork, rechopping each end until it lay at a neat right angle to beam length, was first delimited by an encircling line drawn with a flint chip. Subsequently, and despite the fact that both ends were to be concealed by wall plaster, the ax marks were commonly erased by rubbing with sandstone abraders. Knots likewise were removed by rubbing. Ceiling poles and lintels were treated in the same

way as beams but with less abrader work. Beams and ceiling poles alike appear to have been in position when the mud-and-stone masonry rose above them.

Shakes, or shingles, of split juniper (cedar) were locally preferred in ceiling construction. Placed close together upon the poles and bound to them by yucca thongs, these shakes supported layers of cedar bark and adobe mud to provide a tight ceiling and a floor for the room above (pls. 6, A; 7, A). Averaging between 2 and 3 feet long and an inch or more in width, the shakes were split individually from a log and, if need be, were shortened by sawing part way through from both sides with a flint blade and breaking.

Boards adzed and abraded from sections of pine or fir logs occasionally replaced cedar splints in ceilings; more frequently they appeared as lintels over doors and ventilators. Other examples lay detached and alone. A 32-inch-long fragment of dressed spruce, $2\frac{1}{4}$ inches wide by $1\frac{3}{8}$ inches thick, was found among fallen masonry above floor level in Room 16B (pl. 38, *k*). Another dressed board, $10\frac{1}{2}$ inches wide by 1 inch thick by 12 feet long, floored a 3-inch deep, 11-inch-wide trench across the north end of Room 55.

Posts were often required to prop the ends of beams, even large beams. Apparently rock and mud stonework, without wall plates, lacked strength to support the combined weight of an average ceiling and occupants of the room or rooms above. Posts usually were placed close against the side walls, but not necessarily under both ends of a given beam. In each case we examined, the post stood upon a slab-stone base.

What we believe to have been the prop for a broken beam in Room 16A is shown, in situ, in plates 7, A, and 8, A. It is of yellow pine (*Pinus* sp.) stone-ax hewn and sandstone abraded, the largest example of prehistoric woodwork from the Southwest with which I am acquainted. Here, as in every other planklike artifact recovered during our excavations, thickness lessens slightly from the middle toward the edges. Plate 39, B, clearly illustrates the manner of finishing ends and sides.

This great hewn timber is unique as far as I know, the only one of its kind. Other wooden objects we recovered are not necessarily unique but each stands alone. We found only one fragment of a spindle shaft (U.S.N.M. No. 334691); only one digging stick (oak; pl. 38, *e*); one piece, with square-cut ends and opposed X's incised on one side (pl. 38, *c*); another piece, $\frac{5}{8}$ inch diameter, with one end rounded (the other is burned off) and a squared side notch, the bot-

tom of which has been compressed by pressure and friction (pl. 38, *b*). These latter two, both cedar, are from Room 9B-III.

Bows and arrows.—Only one indubitable fragment of a bow was recovered, a fragment 3 inches long and $\frac{7}{16}$ inch in both width and thickness. It had been partially severed with a flint knife and then broken off. On either side at the tip is a slanting nock for the bowstring; immediately below, sinew wrappings and some sort of adhesive have left a dark encircling band $\frac{5}{8}$ inch wide. But of greatest interest is the fact that the wood is Osage orange (*Maclura pomifera* Schn.),⁵ a wood quite foreign to Chaco Canyon.

Two 5-inch pieces from Room 9B-III, both planoconvex in cross section and tapering toward one end, have the appearance of bow fragments, but they are of willow (U.S.N.M. No. 334693) and one has two X's incised upon its flat side. A third possible portion of a bow is illustrated on plate 38, *d*. It is of unidentified wood 20 inches long by $\frac{3}{8}$ inch diameter at the tip and $\frac{7}{8}$ at the butt, light-colored, compact, and heavy. The butt is rounded and covered by minute nicks of a flint knife; lengthwise striations left by the abrader are plain upon the surface. There is no bowstring nock and no trace of a hand-grip at the larger end.

Our lone fragment of an arrow is a 2-inch section of reed containing the shank of a wood foreshaft with an encircling green band where a sinew wrapping had been (U.S.N.M. No. 334704).

Scraper.—A juniper splinter beveled along its curved edge evidences use as a scraper (pl. 38, *j*). A second, more specialized example from Room 9B-II, is $4\frac{1}{8}$ inches long by $1\frac{3}{4}$ inches wide and $\frac{1}{4}$ inch thick with square-cut ends and back, smoothly abraded sides, and a thinned front edge half polished from scraping or burnishing (pl. 38, *i*).

Resonator (?).—The specimen illustrated by figure 27, drilled at the upper end for ancient repairs, may be an early version of the "notched stick," or "resonator" to be seen and heard widely throughout the Southwest today. Ours is of mountain mahogany, dark and heavy, with a glossy sheen that could be the result of friction from another stick. Notched resonators have been popular pseudomusical instruments among the Pueblos since pre-Spanish times. Kidder (1932, pp. 252-255) found several at Pecos. Parsons (1939, p. 383) notes that "the musical rasp or notched rattle" invariably provides an accompaniment for the Jemez kachina dance no matter where performed. I assume that our Pueblo del Arroyo specimen likewise

⁵ U.S.N.M. No. 334695. Identified by W. N. Watkins, curator of crafts and industries and in charge, section of wood technology, U. S. National Museum.

furnished the rhythm for dance songs. A comparable example, but with only four notches, was found in a cave south of Silver City, N. Mex., and presented to the National Museum in 1879 by Henry and James K. Metcalf (U.S.N.M. No. 35265).

Handle (?).—Figure 28 will suggest to some readers a violin tail-piece. It is of juniper. Indistinct traces of sinew (?) wrappings (no cord marks) are to be seen on each side. One binding, $\frac{1}{8}$ inch wide, encircled the piece immediately below the uppermost hole; another, continuous from the second hole to the bottom, exhibits a variable tension on the wrapping at time of application. The lighter band across the lower end represents a closer, more carefully applied wrapping. I detect no trace of cord wear at the five holes; the gouged-out groove is a shade less than $\frac{3}{16}$ inch deep.

Altar piece (?).—A tablet of cedar less than $\frac{1}{8}$ inch thick, carved in the form of a sandal, is undoubtedly part of an altar piece. Its ornamentation is a black geometric design on a green background (fig. 29); the lighter, middle section is now orange in color, but may have been red. A chemical change has taken place in this area, for the black lines formerly continued across. The specimen is comparable to, but somewhat smaller than, a painted-wood sandal form illustrated by Morris (1939, pl. 145) from Aztec Ruin.

Bits of painted wood from Rooms 44 and 62, too small to suggest either shape or size, may also have been parts of altar pieces (U.S.N.M. Nos. 334696, 334698).

Pot rest.—A loose coil of cedar bark, 7 inches in diameter and with no trace of wrapping, was found among debris of occupation in Room 44 (pl. 38, *h*).

Willow screen.—The partially charred and decayed screen protruding from the fill in Room 16 (pl. 7, B) was made of dressed willows, pierced at intervals of about 4 inches and threaded by yucca cords. Apparently it had fallen with the second-story floor.

Five sections of peeled willows $13\frac{1}{4}$ to $14\frac{1}{4}$ inches long, likewise from Room 16, had been cut off at both ends but are otherwise unworked (pl. 38, *a*). They are not comparable to the peeled and abraded willows customarily used in ceilings of second-type masonry at Pueblo Bonito.

OBJECTS OF BONE

The list given on page 126 includes all 4-footed mammals whose bones were found in the rubbish piles of Pueblo del Arroyo. All, or nearly all, of those mammals presumably are represented among the bone artifacts now before us. Doubt must remain in those instances

where the articulations or other identifying features have been removed or extensively altered. Bones of the mule deer (*Odocoileus hemionus*) predominate, and because they are straight and strong it is understandable that deer leg bones should have been used most frequently for implements. The process of manufacture echoed that in woodworking, namely, separating the desired portion by sawing with a piece of flint or sandstone and then rubbing it to shape.

Awls, the most common of bone tools, vary greatly in shape and size and in the amount of labor expended upon them. Some are mere splinters, pointed to meet a need of the moment; others are so neatly fashioned they must have been treasured by the maker. There are long awls and short awls; thick and thin awls. Typical examples are shown in plate 37. One, $3\frac{1}{8}$ inches in length, was shaped from a fragment of deer mandible (U.S.N.M. No. 334927); at least one was made from a deer rib (No. 334881); one, with an exceptionally sharp point (No. 334885), is unidentified but appears to be made from a fish bone. Leg bones of the deer, rabbit, and wild turkey were favorite awl materials.

We discarded in the field the less meaningful awl fragments but retained 186 specimens for the national collections. Among these, several groups appear of passing interest. Nine, drilled at the butt end like needles, vary in length from 2 to $9\frac{1}{16}$ inches and in maximum width from $\frac{3}{16}$ to $\frac{7}{8}$ inch. One of them (field No. 48), found in the narrow room east of Kiva B, was made from a splinter of bird bone and is at once the shortest and the narrowest of the lot. The longest, from which the tip is missing, was made from a deer metapodial. It was found in Room 1, and its surface, glossy from use and yellowed by age, has the appearance of old ivory (U.S.N.M. No. 334922). Thus the shortest and longest of our nine drilled awls came from rooms I believe were built by immigrants from the north.

Another group consists of six delicate, double-pointed implements needle-sharp at one end, thinned, flattened, and somewhat blunted at the other. They range in length from $2\frac{1}{4}$ to $3\frac{1}{8}$ inches; in width, from $\frac{1}{8}$ to $\frac{1}{4}$ inch. A third series, 13 in number, is of the type sometimes described as "pins." All are round in cross section or nearly so, $\frac{1}{8}$ to $\frac{1}{2}$ inch in diameter, 3 to $8\frac{7}{16}$ inches in length, and usually square cut at the butt.

Dagger (?).—Half of the tibia of an elk (*Cervus canadensis*), pointed at one end and worn smooth along the edges, seems too large and unwieldy for ordinary household tasks (pl. 37, f). It could have served as a dagger, although there is doubt that Pueblo tribes

ever used such a weapon. Daggers are not listed among Pueblo weapons reported by chroniclers of the Conquest period.

Scrapers.—The Pueblo del Arroyo collection includes only one end scraper made from a deer humerus (pl. 37, *s*). Another of the same general type but fashioned from a metapodial (U.S.N.M. No. 334935) was recovered in Kiva I. We have six end scrapers made from deer phalanges, plus a seventh in process of manufacture. One of the six, from Room 32 (field No. 183), has 3 "turkey tracks" incised on its convex surface. Morris (1939, p. 122) collected phalanx scrapers from the Chaco horizon at Aztec Ruin; he expressed the belief they were peculiar to that phase of P. III. Our collection includes only one scraper made from a mammal rib (U.S.N.M. No. 334932), its distal end worn at an angle but without the bevel common to its kind.

Still another variety of bone end scraper is illustrated by four fragments (pl. 37, *a-c, e*). All are toothed, and the teeth are polished through wear, especially on the under side. The second example, *1* $\frac{1}{8}$ inches wide, retains part of both edges but its blade, flatter and sharper than the others, lacks two teeth. That on the outside was broken off first and its stub smoothed by abrasion. The third specimen, least worn of the four, is only a scrap but appears to be full length, *1* $\frac{7}{8}$ inches. Our fourth example, *e*, found among the razed structures west of Room 29 and south of Kiva "c," was cut from a piece of scapula. With both ends present, an original length of *2* $\frac{7}{8}$ inches is indicated. The added specimen, *d*, is of antler, sharp bitted but without notches.

Side scrapers are represented by a fragment of leg bone and two pieces of scapula. One of the latter (U.S.N.M. No. 334929) has been reduced to an oval, *2* $\frac{5}{16}$ inches long by *1* $\frac{3}{16}$, its edge worn all around and the lower end thin and knifelike.

Bull roarer.—Although made from the cannon bone of an elk instead of lightning-riven wood, and although it bears two transverse incisings rather than lightning symbols, the bone instrument, plate 37, *q*, was nevertheless recognized by some of our Zuñi workmen as a "bull roarer," a prayer device twirled at the end of a cord to simulate the wind and thus invite rain.

Flakers.—One of three antler tines apparently had been used as a flaking tool until its tip was blunted and thereafter as a buffer of some sort since the end is now rounded and polished (U.S.N.M. No. 334948). Another possible flaker is a former bone awl (No. 334925).

Bone "beads."—Our collection includes 24 bone beads, so-called,

ranging in length from $\frac{1}{2}$ to $2\frac{1}{8}$ inches. A majority are more or less polished through wear. Morris (1919, p. 42) found necklaces made up of the shorter examples, and Hodge (1920, pp. 126, 134) found some of the longer ones paired upon the left wrist of skeletons as though once attached to a wrist guard. Still longer examples have been reported in lots of 10 to 200 with burials at Aztec Ruin and at Pecos (Morris, 1919, p. 42; Kidder, 1932, p. 260). The significance of such numbers and such association remains a mystery.

At Pueblo del Arroyo we unearthed only four of this longer variety, their ends more or less smoothly rubbed but muscle attachments remaining at the sides. Two, $4\frac{3}{4}$ inches in length and from Kiva E, are of jack rabbit tibias (U.S.N.M. No. 334941); the others, from a cottontail tibia and a wing bone of an unidentifiable bird, were found outside the ruin, west of Room 29 (No. 334942).

Dice.—Two bone "gaming counters," $\frac{3}{4}$ and $\frac{7}{8}$ inch long, were recovered in Rooms 51 and 54, respectively (U.S.N.M. No. 334947). The shorter, made from the leg bone of a rabbit or bird, is without ornamentation but its edges are ground flat on the concave side; the longer, of heavier bone, has rounded edges and its convex face is crowded by four incised X's.

Antler.—In proportion to the numbers of deer and elk bones in local rubbish piles, implements made from antler are surprisingly few. We have only the chisel-like implement shown on plate 37, *d*, a punch or buffing tool (pl. 37, *r*), two unworked tine tips, and two club fragments. One of these latter is of deer antler, its butt end rounded by abrasion (pl. 38, *f*). The second and larger fragment is of elk antler, the remnant of a once formidable weapon (pl. 38, *g*). In Room 32 at Pueblo Bonito, Pepper (1920, p. 161) found a 19-inch-long elk-antler club with a drilled hole at the lesser end for attachment of a wrist cord.

OBJECTS OF STONE

Unlike bone, wood, and fibrous materials, stone persists. Hence the preponderance of stone artifacts in almost every collection from a Pueblo ruin. There are milling stones, or metates, stone axes, rubbing or smoothing stones, abraders, tablets of unknown function, and a greater or lesser assortment of miscellaneous objects.

Hammerstones were the tools with which other stone tools were made. Endlessly repeated blows of stone upon stone gradually wore away the unwanted portions. Any stone that could be held in the hand was a potential hammer, but hard, tough rocks were preferred. As its cutting edge became dulled through use, a hammer was lightly

discarded. Second only to bone awls, hammerstones are the most numerous of ancient Pueblo artifacts. Our excavation notes record the finding of 125 but there were others we did not trouble to report. Some had been quartzite or diorite cobblestones; others, chunks of flint or silicified wood. Of 11 hammers recovered in Room 43 all but 1 were of gray silicified wood from the "Bad Lands" of Escavada Wash, a northern tributary of Chaco Canyon.

Metates and manos.—Of 44 metates and metate fragments unearthed at Pueblo del Arroyo 18 are of the comparatively thin, broad, shallow-troughed variety that I designated "tabular" at Pueblo Bonito, 6 are thicker but likewise troughed, 1 has an over-all grinding surface; 7 mills and 11 fragments are not positively identified in our field notes. Where present, the trough, or mano groove, was open at the lower end.

Deflectors in Room 3 and Kiva "b" are included among our tabular metates and we might have added to our six thicker troughed mills the one that lies, pierced and inverted, over the outside ventilator shaft of Room 3 (pl. 50, B). One tabular metate, 17 inches long by 14 inches wide by $1\frac{1}{2}$ inches thick with a mano trough 14 inches long by $7\frac{1}{2}$ inches wide, had been on the roof of one-story Room 65 and had fallen with collapse of the roof. An unused metate (U.S.N.M. No. 334856) measures $16\frac{3}{4}$ by $9\frac{1}{4}$ by 2 inches; its indicated mano trough, 13 by $5\frac{1}{4}$ inches, is roughened for the first grinding. To maintain their efficiency, grinding surfaces had to be "sharpened" every few days by repecking with hammerstones (Bartlett, 1933, p. 4).

Our lone example of a metate with over-all grinding surface is likewise the only one found mounted in a bin (pl. 48, right). However, measurements for an incompletely described mill recovered in Room 23 ($16''$ long \times $1''$ thick \times $10\frac{1}{2}''$ wide at one end and $6''$ at the other) suggest that it may have been of the same kind.

The binned metate in Room 5 belongs to a class usually described as "flat" or "flat slab" although the grinding surface, however flat from side to side, is invariably concave longitudinally. Kidder (1932, p. 68) describes the type as "plain-surfaced." Brew (1946, p. 147, fig. 174, *g-i*) reports two from Site 12, a P. II settlement with Mancos black-on-white pottery on Alkali Ridge, southeastern Utah. O'Bryan (1950, p. 83, pl. 29, *f*) found one not unlike ours on the floor of a kiva at Site 102, Mesa Verde National Park, a "preponderantly Mancos Black-on-white" site he dates at about A. D. 950. Lancaster and Van Cleave (1954, p. 99) describe the finding of a "flat slab" metate in the kiva-to-tower tunnel at Sun Point Pueblo, a Mesa

Verde ruin somewhat later than O'Bryan's Site 102 but, nevertheless, with Mancos black-on-white pottery predominant. O'Bryan (*ibid.*, p. 109) believes that "flat" metates had largely superseded the troughed variety by the end of the McElmo Phase (ca. A. D. 1050-1150), and Morris (1939, p. 133) seems to agree. My descriptive term "over-all grinding surface," while cumbersome, is clear and precise. Neither "flat" nor "flat slab," unqualified, correctly describes the mill typical of the great Chaco houses.

Woodbury (1939, p. 58) lists one of "the plain surface (slab) type" among 22 metates recovered at a small settlement about half a mile southeast of Pueblo del Arroyo. He misinterprets Pepper, however (Woodbury, 1954, p. 59), as does Katharine Bartlett (1933, p. 24), in attributing "flat" or "flat slab" metates to Pueblo Bonito. When Pepper, not anticipating present-day terminology, referred to metates "of the usual slab form" or to "the flat metate" (Pepper, 1920, pp. 58, 90, 295), he had in mind the broad, thin, tabular mill of the Old Bonitians. There is no record of a metate with over-all grinding surface from Pueblo Bonito. And the finding of one at Pueblo del Arroyo would be surprising were it not for the fact that Room 5 is itself a stranger in Chaco Canyon.

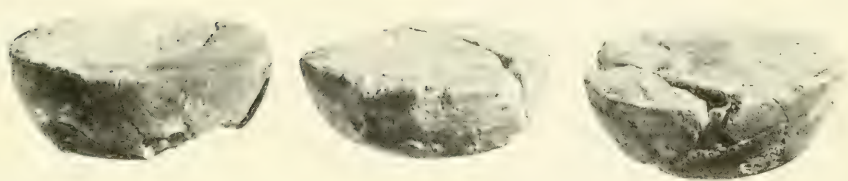
Of 124 manos and 19 fragments reported in our field notes, all but one are described as rectangular with a single flat grinding surface and ends curved to match the concave sides of the mano trough. The exception (U.S.N.M. No. 334820) is a $3\frac{1}{2}$ -inch-long fragment of a two-faced triangular mano of very fine-grained sandstone, $3\frac{1}{8}$ inches in original width and with a present maximum thickness of $\frac{3}{4}$ inch, base to apex. It lay on the floor in the southeast corner of Room 9B-II and both faces are covered with blue paint.

Abraders, usually of friable sandstone, coarse- or fine-grained, were grinding tools. The shape of an abradar does not always reveal a specialized function, but marks left on diversified objects identify a common purpose for the group, reduction by abrasion. Some abraders remained fixed in position while in use; others were held in the hand and moved back and forth upon an object in process of alteration. The two grooved abraders shown on plate 40, *t*, *u*, so-called "arrowshaft smoothers," are in this latter category. Likewise, blocks of sandstone employed in erasing ax marks and knots from ceiling beams may be described as active abraders.

Passive abraders, those remaining stationary, vary in size and texture. That illustrated by figure 30 is of siltstone and is worn equally



A. Figurine fragments from area west of Rooms 42-49.



B. Kaolin cakes molded in a broken pitcher.

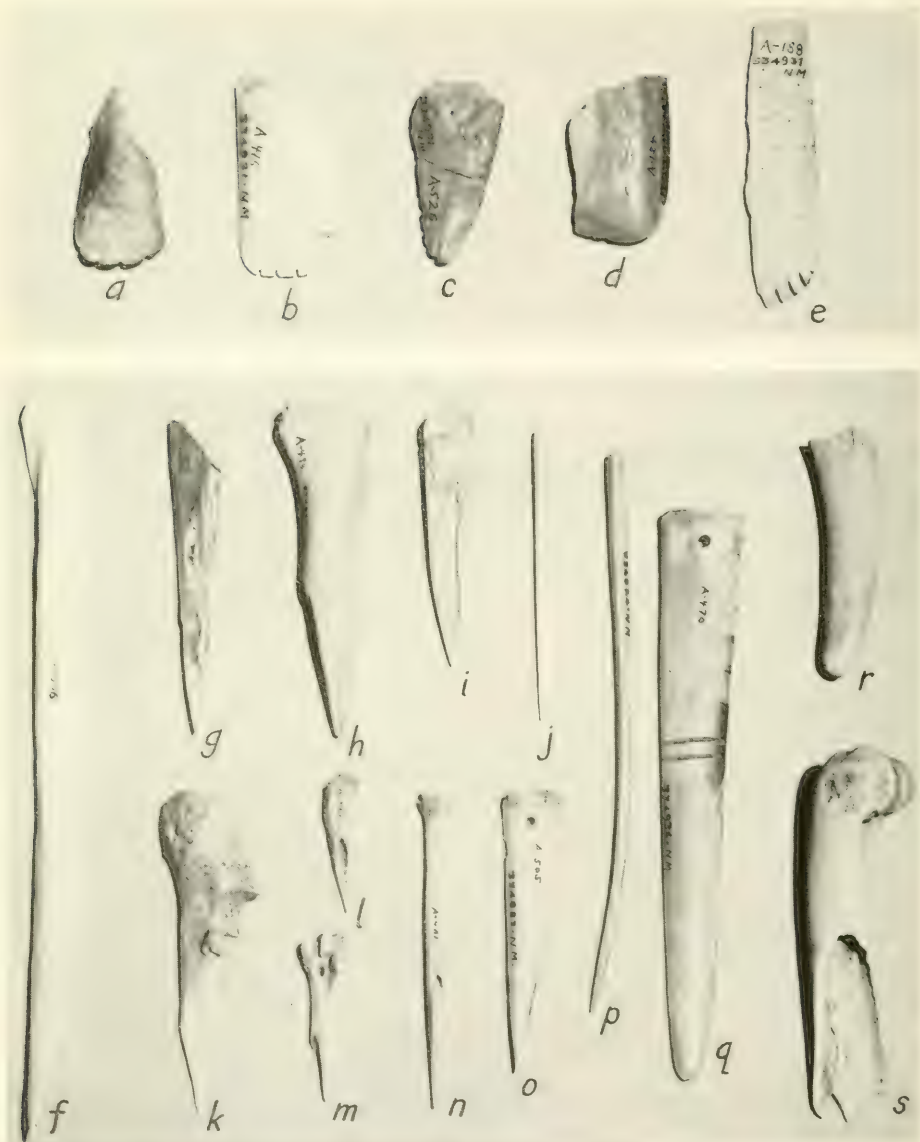


PLATE 37.—Upper, comblike implements of bone (a-e), and lower, bone awls (f-o), pin (p), bull roarer (q), antler punch (r), and scraper (s).

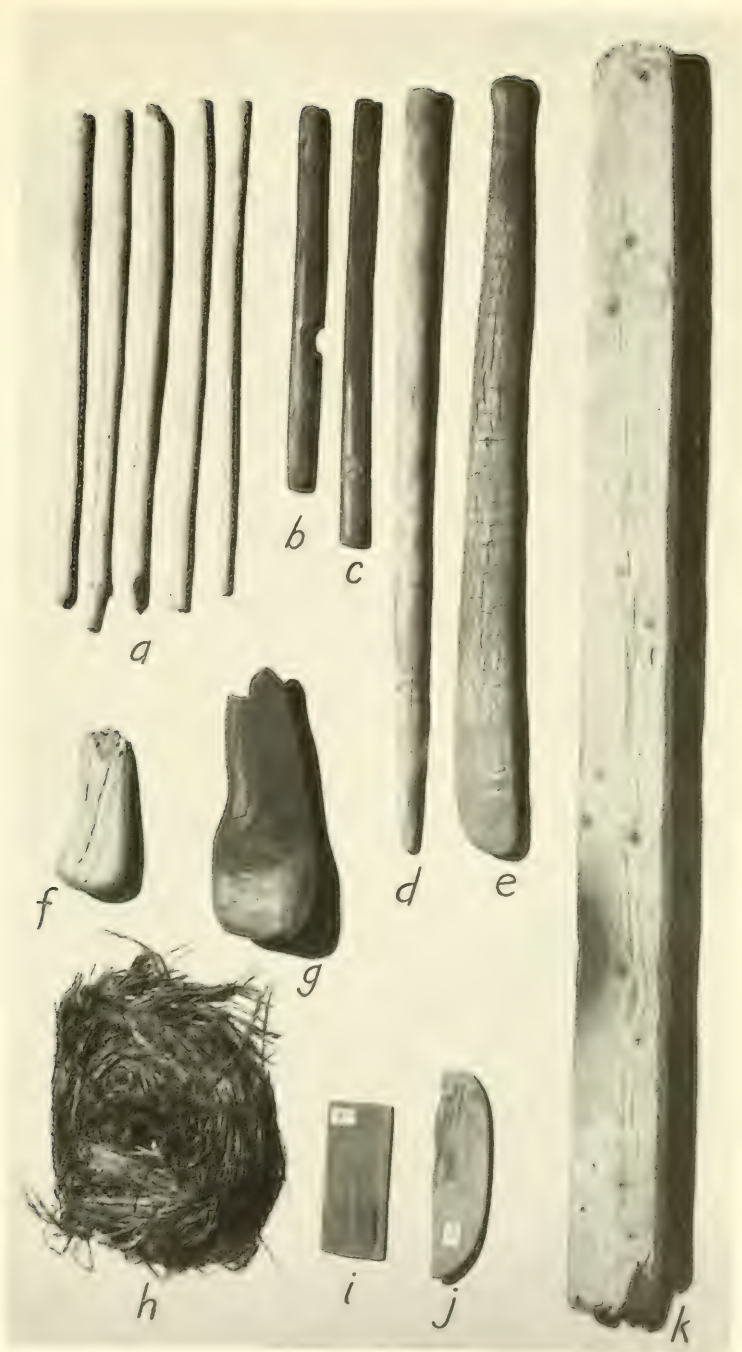
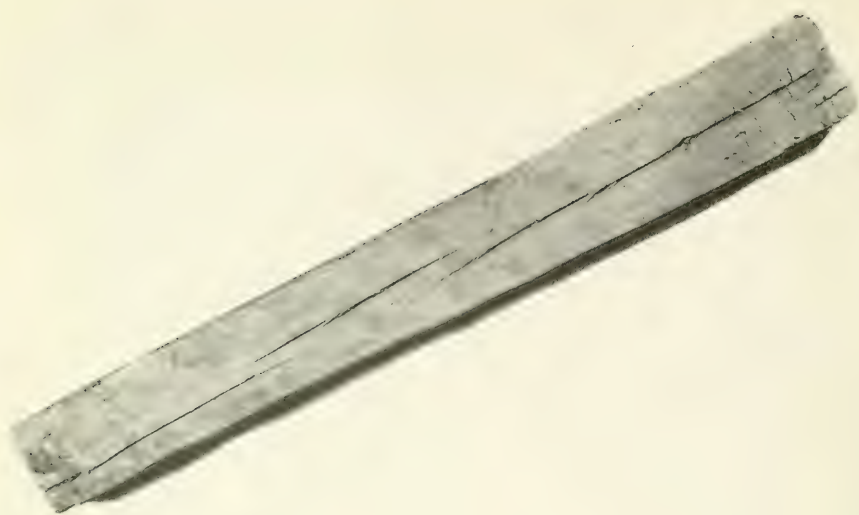


PLATE 38.—Objects and implements of wood, antler, and cedar bark.



A.



B.

PLATE 39.—Hewn pine timber from Room 16 showing abraded sides and stone-ax cut end.

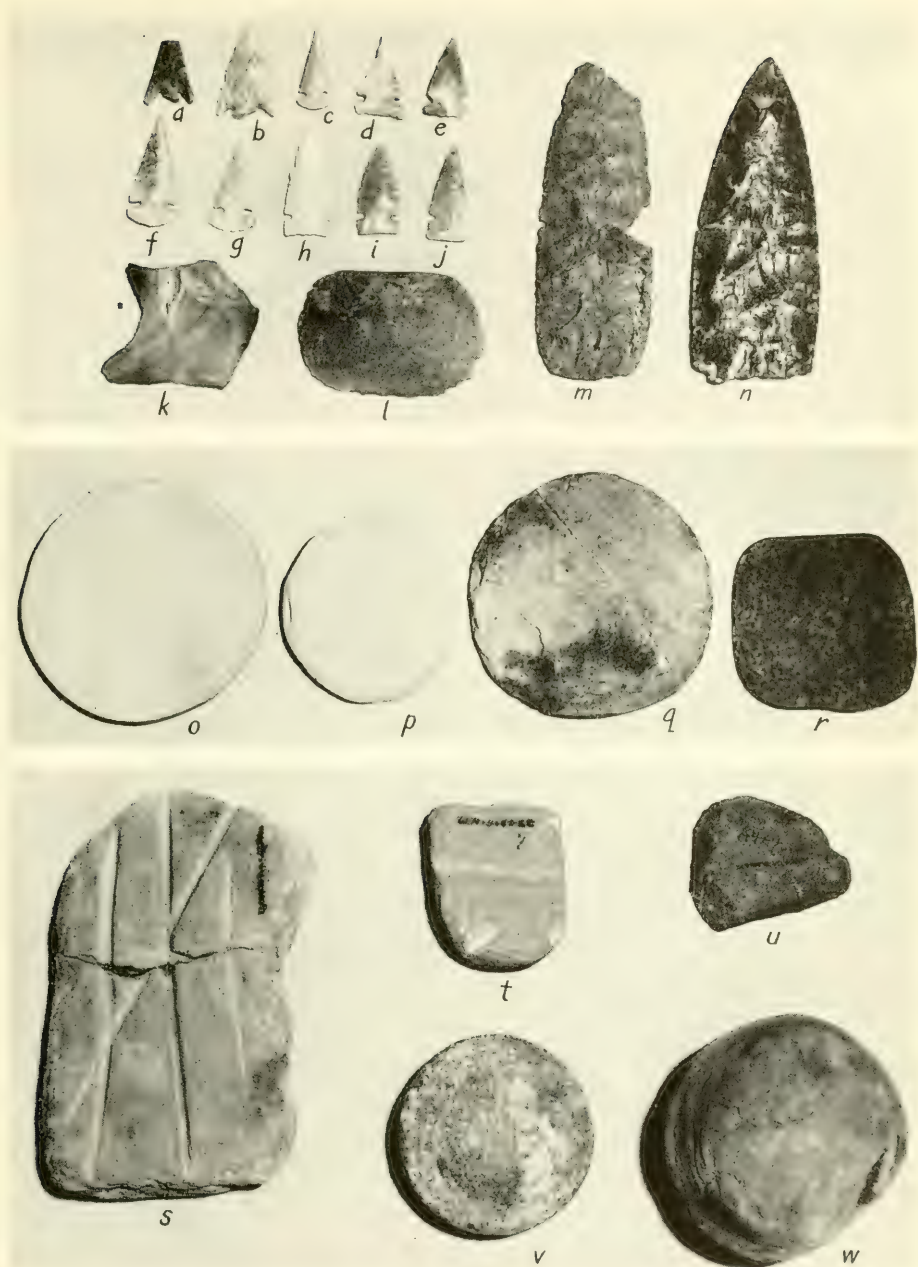


PLATE 40.—*Upper*, arrowheads and knives (*a-n*); *center*, jar covers (*o-r*); *lower*, abraders (*s-u*), discoidal stone (*v*), and a clay stopper for a jar (*w*).

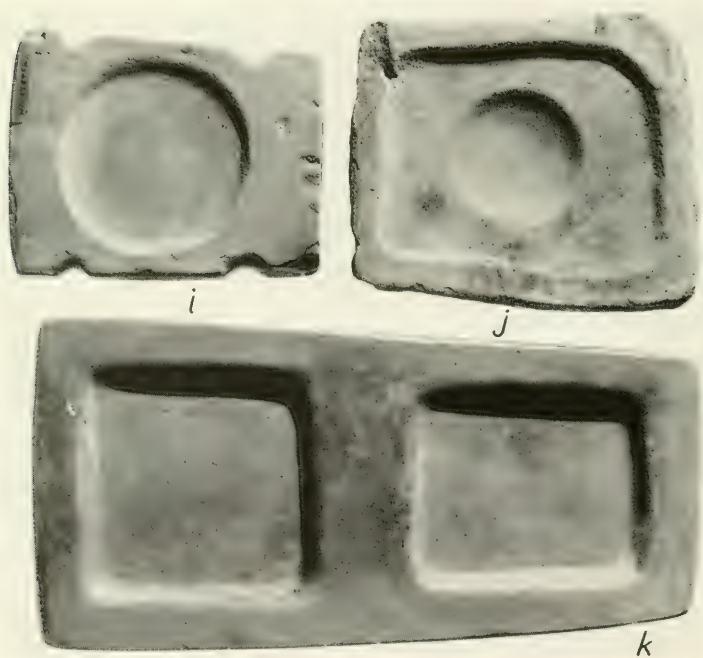
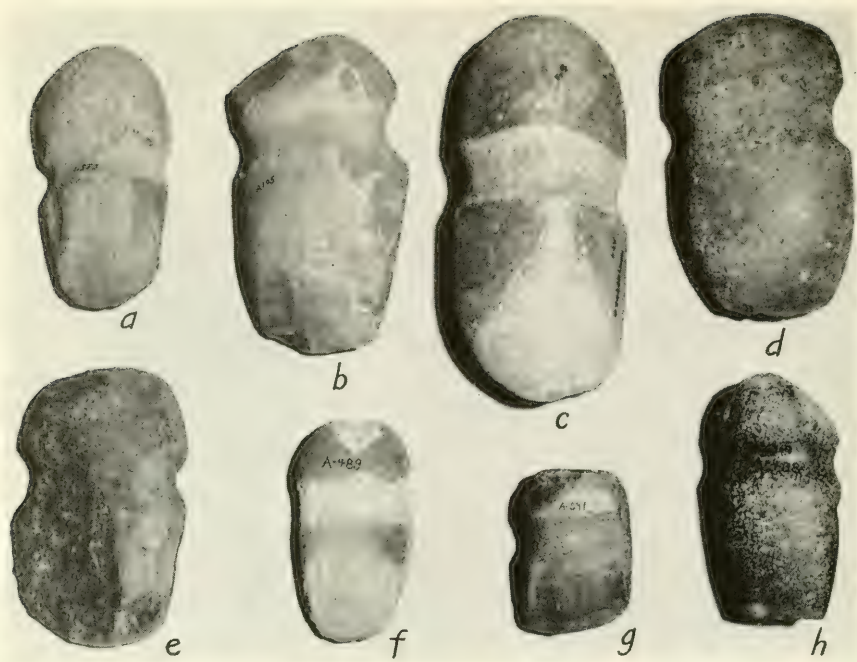


PLATE 41.—*Upper*, stone axes (a-h), and *lower*, paint mortars (i-k).

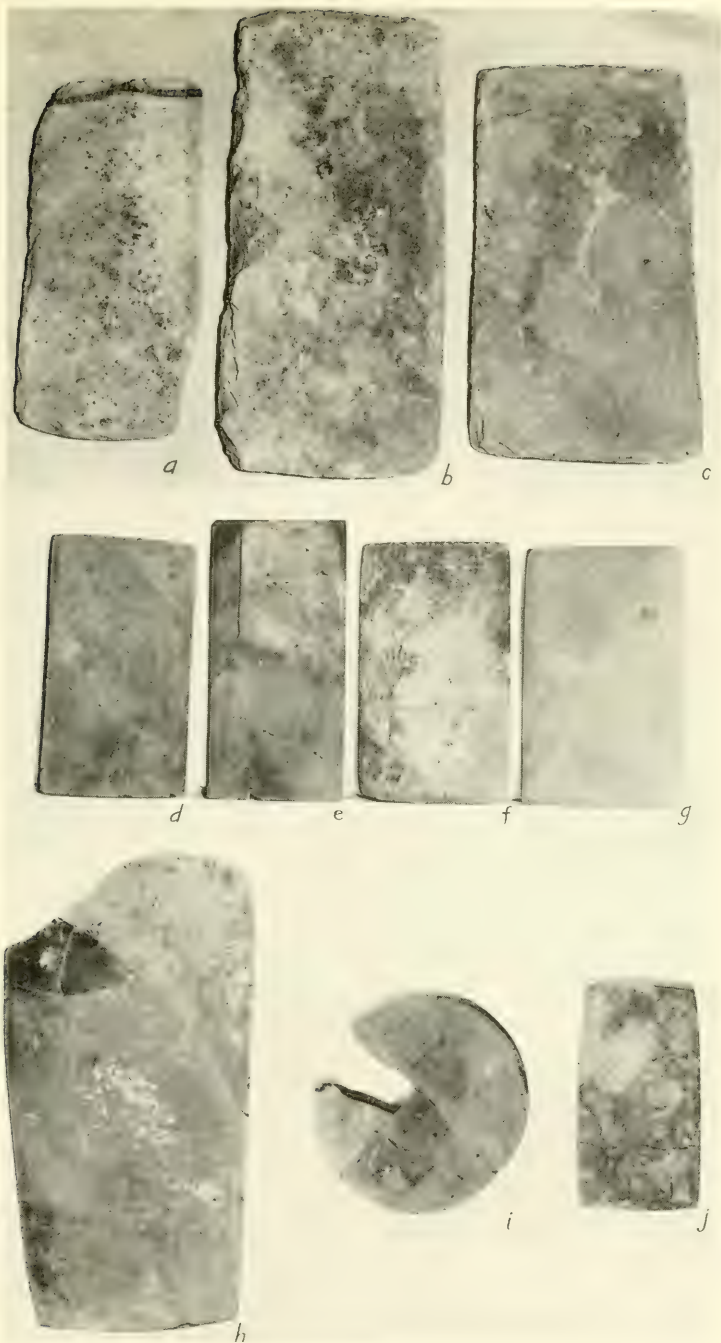


PLATE 42.—Sandstone tablets with spalled edges (*a-c*), polished sandstone tablets (*d-g*), a sandal stone (*h*), ground and polished slate tablets (*i-j*).

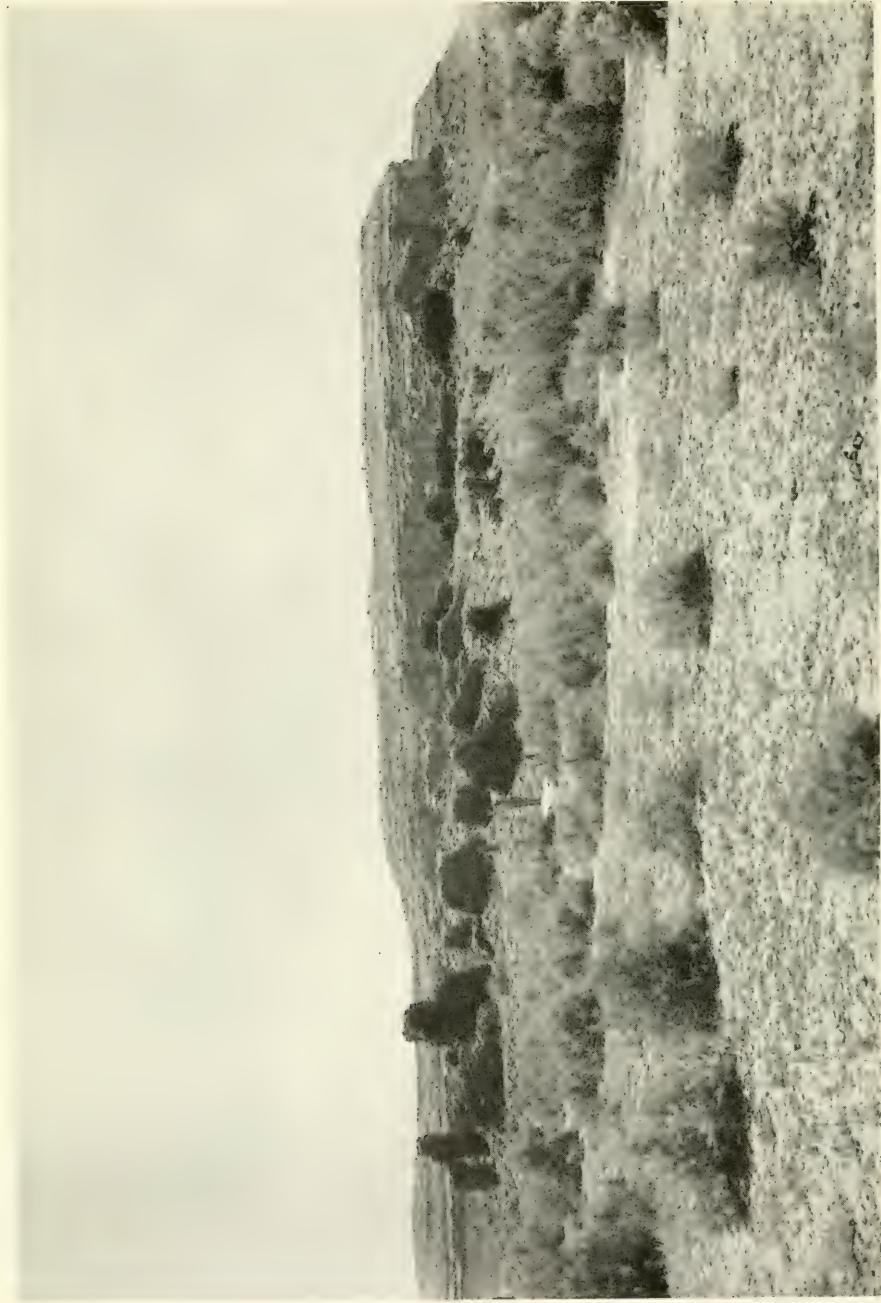


PLATE 43.—Pueblo del Arroyo from the northwest.
(Photograph by Charles Martin, 1920.)



A. Pueblo del Arroyo from the west, Jackson's "old arroyo" at the right; in the shadowed bank at left, above a sunlit spot at the bottom, wide-spreading silt strata and a wall fragment that proved to be part of a McElmo Tower.



B. Jackson's "old arroyo" carried away the south side of the Kiva B enclosure but left part of its west wall (above the standing figure).

(Photographs by Neil M. Judd, 1923.)



PLATE 45

Upper: At left center constructional debris fills an angle formed by the Kiva B enclosure and remains of a single wall extending westward from the southwest corner of the ruin.

(Photograph by O. C. Havens, 1923.)

Lower: Kiva B abuts the pueblo at its outer southwest corner. The paired ends of Room 8A ceiling beams show at either side of a jutting rooftop abutment.

(Photograph by Neil M. Judd, 1926.)



on both sides in the shaping of turquoise and shell ornaments.⁶ A block of coarse red sandstone from the fill in Kiva "c" had been used for the sharpening of bone awls before it was burned and broken (pl. 40, s). In a similar way doorsills here and there and even exposed blocks in house walls were occasionally appropriated for whetting bone awls or stone axes.

A succession of X's incised on the smoothly rubbed face of a sandstone building block (U.S.N.M. No. 334872) from the razed north enclosing wall of Kiva "d," west of Room 48, might have originated in the casual sharpening of a bone awl. So, too, the crosshatching on a fragment of friable yellow sandstone (fig. 38). The inhabitants of Pueblo del Arroyo were not given to the embellishment of house walls, but it seems quite within reason that an occasional individual, assigned the tedium of pointing a bone awl, might have been momentarily inspired to elaborate the permanent record of his industry.

Figure 31 illustrates the two largest of six delicate little abraders, all broken, found in Room 26 together with the tablet described above (fig. 30). All six are of exceptionally fine-grained sandstone; four are planoconvex in cross section and the other two are flat with edges beveled on one side. The six average only $\frac{1}{10}$ inch thick at the butt end; none exhibits any perceptible concavity owing to attrition. I have no idea what these fragile implements were used for, but the Zuñi man who found them, a spare-time jeweler, called them "files" for shaping turquoise and other ornaments.

We have three fragments of abraders that may be likened to saws, two of siltstone and one of medium-coarse sandstone. The latter is the Roman-nosed end of a $\frac{1}{2}$ -inch-thick blade with V-shaped cutting edge (U.S.N.M. No. 334812). The larger of the two siltstone fragments, 3 inches long, 2 inches wide, $\frac{1}{8}$ inch in maximum thickness, likewise has a knifelike edge with longitudinal striations on both sides (No. 334810).

Knives at Pueblo del Arroyo were made from chalcedony, obsidian, and similar glassy rocks. Our examples include the two on plate 40, *m*, *n*, and five fragments. One of these latter (fig. 32) is of more than usual interest because, following the initial flaking, the blade was abraded on both sides and subsequently rechipped in part along each edge. Evidence that household sweepings were sometimes dumped in two or more places is confirmed by a broken blade (pl. 40, *n*) whose

⁶ Listed elsewhere (Judd, 1954, p. 379, fig. 18) inadvertently as from Room 26, Pueblo Bonito, rather than from Room 26, Pueblo del Arroyo.

tip was recovered in Room 28 and the butt in Room 32. There is no opening in the first-story wall separating these two rooms.

Flakes struck from suitable rocks and, if necessary, sharpened by chipping likewise served as knives (pl. 40, *k*, *l*).

Arrowheads from Pueblo del Arroyo are preponderantly of one type, that notched at right angles to the long axis, but may be divided into two subgroups: those with straight or slightly concave base (pl. 40, *h*, *i*, *j*) and those with slightly convex base (pl. 40, *c*, *f*, *g*). There may be no significance in this division, but our collection includes 14 in the first group, 16 in the second. Length varies from $\frac{11}{16}$ to $1\frac{1}{2}$ inches; all are side notched and thus agree with the dominant type from the later sections of Pueblo Bonito. In addition there are three small barbed points from which the stem is missing (pl. 40, *a*, *b*). Only two arrowheads were found in the South Annex, in Room 4 and the long room east of Kiva B, and both belong to our first subgroup (pl. 40, *e*, *i*). Of five points recovered among the ruined structures west of the pueblo, two belong to our first subgroup, two to the second, and one is barbed.

The tip of a green argillite blade, rubbed to a velvety smoothness and with edges saw cut to simulate chipping (fig. 33), is more likely to have seen service in some ritual rather than in warfare or hunting. Found in the milling room, 55, a fact that contributes nothing, the fragment nevertheless is reminiscent of a statement by Cabeza de Vaca, namely, that somewhere on his incredible journey across northern Mexico in the early sixteenth century, unidentified Indians gave one of his companions "five emeralds, shaped as arrowpoints, which arrows they use in their feasts and dances" (Bandelier, 1905, p. 156).

Drills are four in number, three of chalcedony and one of jasper. Two are reworked fragments of arrowheads and a third is part of a broken blade that, despite a width of $\frac{7}{8}$ inch, nevertheless had been renotched for hafting (U.S.N.M. No. 334794).

Scrapers.—During seven seasons' research at Pueblo Bonito and Pueblo del Arroyo, we found only one chipped end scraper and that in Kiva J, Pueblo del Arroyo (U.S.N.M. No. 334796). From the same ruin we recovered only seven flakes chipped as side scrapers. Two are shown on plate 40, *k*, *l*.

Hoes.—Figure 34 illustrates what I prefer to call a hoe although it is clearly a reworked *tcamahia*, a type of prehistoric celtlike implement featured on certain Hopi altars (Fewkes, 1900, p. 982; 1909, p. 39). Our specimen, of dark-gray limestone, has been made from a *tcamahia* by narrowing the upper third with a stone hammer and then abrading

the rough edges. Attached to the end of a straight wooden handle, it would provide a very serviceable scuffle hoe.

Part of a second hoe blade, of the same gray limestone but wider and with a squarer cutting edge, was recovered from Room 54 (U.S.N.M. No. 334818), and the battered remnant of a third example lay among floor sweepings in Room 62 (No. 334819). This latter is of the fawn-colored laminiferous shale favored for hoes by P. II-III peoples of the Four Corners area.

I prefer to call these implements hoes rather than *tcamahias* because examples in the National Museum (Nos. 35397A, 303258) and elsewhere provide convincing evidence that they are successors to the equally efficient mountain-sheep-horn hoes of the Basket Makers. That some of these prehistoric blades eventually found a place in modern Hopi rituals is not to be questioned, but midway, in early P. III times, they were still hoes although perhaps only hand hoes or trowels. The three from Pueblo del Arroyo, two of them fragments, were all imported and all had been reworked.

Jar covers.—Of 20 typical jar covers brought to Washington for the national collections, a majority is discoidal. They vary in diameter from $2\frac{1}{2}$ to $8\frac{1}{8}$ inches. All but two are of sandstone; all were made by spalling off the edges of a thin tablet and then by abrading the sides and perimeter. Four are reworked fragments of thin, smooth, fine-grained sandstone tablets at least one of which had been sandal shaped. One cover, $6\frac{1}{2}$ inches in diameter by $\frac{5}{8}$ inch thick and made from a section of a sandstone concretion, was found in Kiva B and had seen secondary use in preparation of yellow paint (U.S.N.M. No. 334839). Traces of red paint remain on two other specimens. A small squared cover (pl. 40, *r*) from Kiva "b" was shaped from a slab of mottled slate that could have originated in the San Juan Mountains.⁷ The same mountainous area is also given as the most likely source of the calcareous siltstone from which was made a small discoidal jar cover found in Room 24 (U.S.N.M. No. 334833).

Discoidal.—A single discoidal stone that, in shape and workmanship, is indistinguishable from the well-known Chunkee stones of the southeastern United States was described on page 104 (pl. 40, *v*).

Paints and paint mortars.—We unearthed only one piece of red paint worth cataloging—a columnar bit of reddle $1\frac{3}{16}$ inches long and rubbed at both ends (U.S.N.M. No. 334782)—but we noted from time to time stones on which paints had been prepared. In addition to the three jar covers mentioned above, we retained two *manos* and

⁷ Report of John B. Reeside, Jr., U. S. Geological Survey.

a mano fragment stained, respectively, with red, green, and blue paint. A bricklike block of fine-grained rock from Room 41, smoothed on all six sides (No. 334824), is coated with a black liquid that may be carbon paint for pottery decoration. "The black material appears to be organic matter [since it] can be driven off by heating to red heat, leaving a brownish residue."⁸

Kaolin provided a chalklike white paint and a surface coating for pottery. The three cakes of prepared kaolin shown on plate 36, B, were molded in the body portion of a broken pitcher, as we know from the identical concavity on their bottoms. Found in the southeast corner of Room 51, the three cakes clearly were made by pouring a thick kaolin solution into the container and allowing it to harden. At Zuñi, toward the close of the nineteenth century, a surface slip for earthenware vessels was prepared in much the same way. "A white clay is dissolved in water," writes Mrs. Stevenson (1904, p. 375), "and then made into cones which are dried in the sun. When required for use these cones are rubbed to powder on a stone, again mixed with water, and applied in the liquid state . . . with a rabbit-skin mop."

A smaller cake of kaolin, gouged out on top, was found in the fill of Room 47 (U.S.N.M. No. 334786).

Two paint mortars, both of unusually fine-grained sandstone, are illustrated on plate 41, *i*, *k*. The first has no trace of paint in its $\frac{1}{4}$ -inch-deep basin, but on the second, *k*, red paint had been ground in the square compartment, black paint in the other. Each basin has a maximum depth of $\frac{7}{16}$ inch. This double mortar was among a number of unusual artifacts recovered in Room 27 among the wreckage of an upper story. In the adjoining room, 23, we found half of a sandstone doorslab (U.S.N.M. No. 334849) on which yellow and red ochers had, in turn, been ground and liquidized.

The third specimen (pl. 41, *j*), with a secondary depression in the middle of the grinding surface, is of reddish sandstone and bears traces of black paint. It comes from Kiva D, Pueblo Bonito, and is shown here merely for comparison.

Whitewash, while not a paint in the same sense as the pigments mentioned above, was in local use as we know from traces of it here and there, and I believe the light-gray, chalky sandstone (U.S.N.M. No. 334877) piled in the southwest corner of Room 46B was whitewash stored against future need. Our Zuñi workmen reported a de-

⁸ Report of E. P. Henderson, associate curator of mineralogy and petrology, U. S. National Museum.

posit of it in a shallow cave high up on the south side of the canyon, overlooking Casa Rinconada.

Pestles.—Of five pestlelike specimens in the collection none bears any suggestion of paint. One (U.S.N.M. No. 334861) is of friable sandstone and more or less discoidal; another (No. 334814), likewise of friable sandstone, is cone shaped. A third specimen (No. 334772) is of the soft, fine-textured, light-colored sandstone used as white-wash, while the remaining two (Nos. 334771, 334862) are parts of hard cobbles doubtless brought to Chaco Canyon from some northern riverbed. In each case the grinding surface lies at a slight angle to the long axis.

Axes and mauls.—We recovered eight stone axes and ax fragments, all made from waterworn cobbles. Only three (pl. 41, *a*, *d*, *f*) retain their cutting edges. One, *c*, was never finished; one, *e*, was merely notched for hafting. Another, *f*, made from an oval cobble of weathered arkosic sandstone and notched transversely across the poll, is too light in weight, $8\frac{1}{4}$ ounces, to have been of real service in timber work. The last two specimens in the series originally had the interrupted, or three-quarter, groove of southern axes, but in both cases the groove was subsequently continued all the way around. The smaller of these two (pl. 41, *g*) last saw use as a maul or clubhead, but its companion, fractured by a single unfortunate blow, was carried to Kiva I for the reshaping that never came.

Hematite cylinders.—Two specimens come from Kiva "c" and from Room 4, respectively. The former (U.S.N.M. No. 334781), $\frac{1}{2}$ inch in diameter by $1\frac{3}{16}$ inches long, was found at the north end of a pole imprint paralleling the west margin of the kiva's Chaco-like subfloor vault. The second example (No. 334780), longer than normal ($2\frac{3}{4}$ inches), is oval in cross section and varies in maximum diameter from $\frac{7}{8}$ inch at one end to $\frac{5}{8}$ at the other. It is possible this cylinder was never finished since longitudinal abrading facets remain upon its surface.

Stone tablets.—Five remarkable sandstone tablets, together with a number of other unusual artifacts, were found in Room 23. All are of exceptionally fine-grained calcareous sandstone; all were shattered when the ceilings and upper walls crashed through into the lower room. The more broken of the five (U.S.N.M. No. 334845) measures $14\frac{3}{4}$ by 8 by $\frac{1}{4}$ inches; the others are shown on plate 42, *d-g*. First of these four bears on the opposite face traces of yellow paint, apparently ground and mixed there. The second (the red line and enclosed area at upper left are ingrained) and fourth tablets are slightly discolored

by smoke on the unphotographed side; the third, as will be noted, is stained by twilled matting. The V-mark on this third specimen and the scratch above are scars from the excavator's pick.

A sixth tablet from Room 23, of slate rather than sandstone and discoidal instead of rectangular, may be seen on plate 42, *i*. Despite a degree of polish, striations left by the abrader remain on both faces and around the circumference. Thickness varies from a maximum of $\frac{7}{8}$ inch at the center to about $\frac{7}{16}$ inch at the edge, the reduction being from both faces. A rectangular slate tablet, abraded to a thickness of $\frac{5}{8}$ inch at the edge and $\frac{3}{4}$ inch at the middle, was among the diversified objects hurled into Room 27 by collapse of its ceiling (pl. 42, *j*).

Tablets made from comparatively thin slabs of sandstone by spalling back the edges and leaving the natural cleavage planes on either side often served to close doorways or ventilator openings (pl. 51, lower). However, narrow tablets such as plate 42, *a, b*, from Room 65, a store-room, clearly were intended for some other purpose.

Sandal-shaped tablet.—Only one (pl. 42, *h*) was found in Room 23 with the five thin sandstone tablets described above and other artifacts. From the size of this lone example, $14\frac{1}{2}$ inches long by $7\frac{3}{4}$ inches maximum width, we may assume that it probably served as an altar piece in some unknown ritual. A sandal-shaped specimen carved from wood and painted is considered on page 131 (fig. 29).

The well-worn fallacy that sandal-shaped tablets were forms or patterns used by the prehistoric Pueblo Indians when weaving their footgear apparently originated with a quotation from Frank Hamilton Cushing published by Dr. J. F. Snyder (1899, p. 8) in his short article on the Cliff Dweller "sandal last." Snyder's almost forgotten paper was prompted by a "baked clay" impression of a decorated sandal in the M. C. Long collection from Butler Wash, southeastern Utah. This rare specimen, now fortunately preserved in the Museum of Northern Arizona, has more recently been described by John C. McGregor (1948, pp. 24-28).

Effigy.—A carving that may represent the head of a mountain lion (fig. 35) was found in the sandy-earth fill of Room 64. It is of yellow friable sandstone and its nose was broken away so long ago there is no perceptible difference in color between the fractured area and that adjoining. Eyes are not indicated. The neck, apparently designed to be socketed, preserves on its uneven base pittings of the shaping hammer.

Mountain lion, "hunter god of the north" (Cushing, 1883, p. 25), is invariably carved from rock of a yellow color; carvings of other

colors identify lesser gods associated with the other five directions. In 1897 Fewkes (1900, p. 980) saw a mountain-lion effigy on the altar of the Antelope Society at the Walpi Snake ceremony; Mrs. Stevenson (1904, p. 245) reported a "cougar of cream-yellow sandstone" among the animal representations on the altar of the Eagle Down Fraternity at Zuñi. A mountain-lion figure is kept close at hand in a Zuñi household and is fed every day while a man is deer hunting (Parsons, 1939, p. 304). Again (*ibid.*, p. 480), "there is always the greatest reluctance to remove a fetish, which is sometimes left behind, but looked after, in an otherwise abandoned house."

Room 64 had been vacated and abandoned, since we detected an appreciable amount of floor sweepings in its 4-foot-deep sandy fill. The "lion" head was found in this fill together with a large tabular metate, fragments of a smaller troughed metate, four manos, part of a turkey skeleton, miscellaneous flint and obsidian chippings, 700 potsherds, and like discards.

Pipe.—An inch-long fragment from Room 55 is our sole evidence that stone pipes were known at Pueblo del Arroyo (U.S.N.M. No. 334687). It is of polished steatite and of the "cigar-holder" type familiar throughout the Chumash area of California.

Miscellaneous stone.—A fragment of glassy, vesicular slag (U.S.N.M. No. 334800), recovered near floor level on the east side of Kiva C, was described in connection with comparable material from Pueblo Bonito (Judd, 1954, p. 293, pl. 70, fig. *b*). It is 4 by $2\frac{3}{4}$ by $1\frac{1}{4}$ inches in size and floats. Mineralogists disagree as to its origin, but doubt that it was a consequence of the fire that destroyed Kiva C.

OBJECTS MADE OF CLAY

Jar stopper.—A stopper for a jar with a 3-inch orifice was found in the southeast corner of Room 23 (pl. 40, *w*). It is made of sandy clay and is unfired, although exposure to an open fire has burned and blackened it somewhat.

Pipe.—In addition to the steatite fragment noted above, we have part of a tubular clay pipe (fig. 44). This latter, however, bears a Pueblo I-like punctate decoration, and flakes of mica glisten on its gray, lumpy surface; it is the only artifact, besides a small quantity of late potsherds, found in Kiva "a," west of the ruin.

Figurines.—Three earthenware figurines of molded clay, hard but apparently unfired, are represented in figure 37, *a-c*. The first was among half a dozen miscellaneous objects pressed by weight of the overburden into the softened adobe floor in the southeast quarter of

Room 9B-II. In shape and execution it is strikingly like a small effigy from Ruin A, Marsh Pass, illustrated by Kidder and Guernsey (1919, p. 143, fig. 62, *b*). Squares of charcoal represent eyes on the next two. Figure 37, *c*, largest of the three, was found among the rubble filling Kiva "b." An unillustrated fragment of fired clay, possibly the upper part of a figurine (U.S.N.M. No. 334682), is molded after the manner of figure 37, *b*, but lacks any representation of facial features.

The fourth figure (fig. 37, *d*), of yellowish-gray sandstone rather than clay, is included here merely for convenience in presentation. It is from Kiva I and featureless. A very similar specimen, carved from juniper, measures $2\frac{1}{8}$ inches long, $\frac{3}{4}$ inch in maximum width, and $\frac{5}{16}$ inch thick from foot to neck (U.S.N.M. No. 334701). Above the neck the head tapers from both front and back to a thickness of $\frac{3}{16}$ inch at the top. As with that of sandstone, there is nothing about this juniper carving to identify it with the figurines except shape.

Fragments of zoomorphic vessels will be considered under pottery.

VI. POTTERY

Our knowledge of Pueblo del Arroyo pottery derives from studies made at Pueblo Bonito. Here, four years after inauguration of our explorations and two years after beginning work at Pueblo del Arroyo, I called in Frank H. H. Roberts, Jr., and the late Monroe Amsden and delegated to them the colossal task of analyzing the sherd collections from both ruins. Two yard-square columnar cuts through 12 feet of previously undisturbed household rubbish under the West Court at Pueblo Bonito revealed the local pottery types and their sequence.

Practically all black-on-white potsherds from the lower 8 feet of Test II, to limit these remarks, were types Amsden and Roberts called "the Transitional" (because it looked to be a transition between pre-Pueblo and Early Pueblo wares) and a decadent variation, "the Degenerate Transitional." However, in the upper 50 inches of that same test there were 43 fragments (3.1 percent of all black-on-white sherds from the 12-foot-deep cut) ornamented with straight-line hatching and 31 fragments (2.3 percent) of a type designated "the Chaco-San Juan."

Basing their classification on ornamentation, shape, and surface finish, Roberts and Amsden separated our Pueblo Bonito potsherds into 21 categories. However, in my earlier reference to their findings (Judd, 1954), I focussed attention upon eight types only: Transitional, Early Hachure, Solid, and Plain-banded culinary as representatives of the Old Bonitians, the founders of Pueblo Bonito; Late Hachure, Chaco-San Juan, Mesa Verde, and Corrugated-coil culinary ware as equally representative of the Late Bonitians. Since no fragment of Early Hachure was recovered below the upper 50 inches of that 12-foot-deep rubbish pile I erred in placing it with Old Bonitian types. I erred also in giving Mesa Verde ware the weight of a local type rather than identifying it as a late and limited import. I should have recognized the Degenerate Transitional for what it truly is, an important derivative of Transitional and a long-lived product of the older portion of the population.

Paraphrasing Roberts's field notes, our Transitional black-on-white (pl. 20, A) was at first thickly slipped and well polished prior to ornamentation. Later, scrapers and hand-smoothing gradually replaced polishing stones; slips became thinner and thinner and finally

were omitted altogether on bowl exteriors. Ladles were of the half-gourd type, pitchers were rather squat and wide mouthed, ollas were round bottomed, tall and egg shaped, with a low neck and often with a bulge between neck and shoulder. Bowls were deep, approaching the hemispherical, with rounded bottoms, and direct, tapering rims.

Bowl, pitcher, and jar lips were ringed with a black line in which there was an appropriately located line break. This interruption, sometimes referred to as "the spirit path," is rarely overlooked even today. Ruth Bunzel writes (1929, p. 69): "The Zuñi potter who closes the circle or 'road' around her pot feels that her own life road will end, and she will die."

Decoration, in iron oxide paint, was generally banded in bowls, zoned on pitchers and ollas. Design elements, in either curvilinear or rectilinear composition, included stepped lines and triangles, interlocking whorls, squiggled hachure, and ticked lines often running past corners. Degenerate was merely an uninspired outgrowth of the Transitional, with the same forms and finish, and the same decorative designs carelessly accomplished. Together, Transitional and Degenerate Transitional were not only the principal pottery products of the Old Bonitians but the predominant ware of Pueblo Bonito.

The Solid (pl. 20, B) first appeared as a contemporary of the Degenerate Transitional, with like shapes and surface treatment but with new ventures in embellishment. Its designs, mainly precursors of Early Hachure, favored broad, heavy lines and pennantlike elements, usually in an all-over pattern and sometimes balanced with Early Hachure figures. Indeed, the Solid was a bridge between the Degenerate Transitional and Hachure A, but its popularity was relatively brief. Production had ceased before introduction of Hachure C.

The famed hachured pottery of Pueblo Bonito, sherds of which were not found below the upper 4 feet of the old subcourt debris heap, developed in three stages (pl. 21, B). At first composing lines were widely spaced and often heavier than their frames (A). Subsequently this practice was reversed and framing lines became the heavier (B). Bowls continued round bottomed with direct, tapering rim and black-painted lip; ladles of the half-gourd form persisted but the bowl-and-handle type began to appear; pitchers developed smaller bodies and longer necks, with an emphasized line break inside the neck.

An initial preference for curvilinear designs gave way before the rectilinear; shaded tips and filled-in corners and solid elements shadowing the hachured figures were favored successively. Hachure B,

with its heavy frames and lighter composing lines on a white or cream-colored slip, has long been recognized as the most distinctive of Chaco Canyon types. Next to the Transitional Degenerate group it was the most abundant variety at Pueblo Bonito.

Hachure C, identified by its finer composing lines and more expert brushwork, was a late creation in the occupancy of the village. New vessel forms were introduced, and the cylindrical vase, presumably created during Hachure B times, reached perfection in the Hachure C period. Pitchers with absurdly small bodies and very long necks were another outstanding shape. Ladles were entirely of the bowl-and-handle form. Hachure C differs from its predecessors not only in its superior brushwork and its thinner, closer composing lines, but also in the complete absence of shaded tips and solid elements in its design composition.

These several black-on-white pottery types, from the Transitional to Hachure C, have certain features in common. They are thin-walled and hard, with preponderantly sherd-tempered pastes blue-gray to dirty white in color, hand smoothed and slip washed, decorated with a mineral paint and fired in a reducing temperature. Rims are direct and tapering and invariably painted black. This black-painted lip, with a line break usually emphasized, is one of the diagnostics of Chaco Canyon pottery. In doubtful cases I have identified iron oxide paint by the simple magnetic test proposed by Colton (1953, p. 21).

Our controversial Chaco-San Juan variety (pl. 21, A) was so named because it appeared to combine certain Chaco techniques of manufacture with decorative designs more at home north of the Rio San Juan. Like Hachures A-C it was not represented in the lower 8 feet of Tests I and II but did occur in the overlying 4 feet. While some vessels were left unslipped on the outside, most exteriors were surfaced with a conspicuous yellowish- or grayish-white slip and stone polished. Bowls predominate in this group, and bowl interiors are usually decorated with a repetition of the same unit, banded and framed as on proto-Mesa Verde ware (Kidder, 1924, p. 67). Bowl exteriors remain plain except, perhaps, for a belt of watered slip around the upper half and a smear of slip paint across the bottom. Unlike local black-on-white types, however, the Chaco-San Juan was decorated with organic paint, a northern trait.

Shape provides another tie with the north. Chaco-San Juan bowls are shallower than local types with straighter sides, flatter bottoms, and rounded lips that are boldly ticked and provided with a line break

that is not only emphasized but often overemphasized. Jars tend to be squat and, like large bowls, are normally equipped with downraking handles; pitchers have small bodies and high, cylindrical necks as do those of Hachure C. Pitchers and jars usually have concave bases. The flat-bottomed, slope-sided mug, a proto-Mesa Verde form, was introduced during this period. Irrespective of shape, Chaco-San Juan vessels have thicker walls than do their Chaco counterparts.

Several years ago, to compare Pueblo Bonito pigments and tempers with those in La Plata Valley pottery, Miss Anna O. Shepard examined all sherds from two of our stratigraphic tests (II and IV) together with representative lots selected by type. Her observations have since been published (Shepard, 1939, p. 280; see also Judd, 1954, pp. 181-183, 236-238) but leave us with an intriguing problem, the presence of sanidine basalt as a tempering agent. This igneous rock, not known to occur in the Chaco country, was found as inclusions in the sherd temper of our three hachured varieties (A to C) but not in that of earlier mineral-paint types (Degenerate and Solid). It also appeared secondarily in the organic-paint, Chaco-San Juan group, a type predominantly sherd tempered but sometimes with bits of quartz, feldspar, or other rock added. In contrast, sanidine basalt appeared as a direct, primary temper in much of the culinary ware, the proportion varying from about a quarter of the pot fragments from the lower 8 feet of Test II to half of those from the upper 4 feet.

Since sanidine basalt occurs as a primary temper in Pueblo Bonito culinary wares and secondarily in both mineral- and organic-paint black-on-white types, Miss Shepard reasons that the Bonitians probably imported their cooking pots from the Chuska Mountains, 50 air-line miles to the west, the nearest recorded source of the rock and an area wherein sanidine basalt was the customary temper for pottery.

With one exception, the pre-Pueblo, the 21 pottery types Roberts and Amsden named at Pueblo Bonito are also represented at Pueblo del Arroyo. Outwardly there are no visible differences in sherds from the two ruins, and the data Miss Shepard obtained from our Pueblo Bonito collections should also apply to those from Pueblo del Arroyo. The latter ruin is the younger of the two, however, and consequently fewer early-type sherds were found in it.

After eliminating all recognizable duplicates, Amsden and Roberts tabulated 203,188 potsherds from Pueblo Bonito and 77,405 from Pueblo del Arroyo. Among these the eight categories I selected to

distinguish between the older and later elements in the Bonito population occur at the two sites in the following proportions:

<i>Pottery type</i>	<i>Pueblo Bonito</i>	<i>Pueblo del Arroyo</i>
Transitional	5.6	0.1
Degenerate	3.7	0.4
Solid	5.0	1.8
Plain-banded	14.7	0.4
Early Hachure	7.6	4.5
Late Hachure	1.3	3.7
Chaco-San Juan	6.6	8.6
Corrugated-coil	33.5	54.7

The number of restorable earthenware vessels (118) recovered during our excavations at Pueblo del Arroyo is surprisingly large in comparison with other classes of artifacts. Some had been broken and discarded with floor sweepings; others had fallen with collapse of upper stories. Only three were complete when found. Thirty-three came from six ground-floor rooms wherein household waste was present in quantities justifying the designation "dump." Fourteen restorable vessels were recovered from Room 15, 26 from Room 27, and most, if not all, had been in the second story and were shattered when its floor gave way. Twelve corrugated pots stored on the floor of one-story Room 65 were crushed when the roof caved in; six more, in fragments, were tossed in later with sweepings from nearby homes. For comparative purposes these diverse utensils are most satisfactorily considered according to shape.

Bowls.—Our 27 black-on-white bowls vary in diameter from 5 to 13½ inches and in depth from 2 to 7¼ inches. Averages are 10½ and 4½ inches, respectively. Nearly half are listed in our Chaco-San Juan classification although several fall short of the Roberts-Amsden specifications for that group. Brown-with-polished-black-interior and black-on-red bowls were few in number. Sherds of foreign wares were still fewer.

Figures *a*, *b*, plate 47, show two restored bowls from Room 5, one of the casual structures abutting the outer south side of the pueblo. Both are ornamented with vegetal paint; both are Chaco-San Juan types. The first, apparently hand smoothed, has a rounded rim that is irregularly ticked. In contrast, the second (U.S.N.M. No. 334620), with its flattened, undecorated rim, is stone polished inside and out.

In shape at least the bowl interred with the Room 40 burial (pl. 24, *d*) is Chacoan, but its dark-gray pigment is organic; as is that on the accompanying Chaco-San Juan pitcher (pl. 24, *e*).

Among 14 vessels recovered in Room 15 are 3 black-on-white bowls (pl. 22, *d-f*). One of these, *e*, a Chaco-San Juan creation, presumably had been broken before collapse of the ceiling, since a third of its fragments were not present. The other two, *d*, *f*, are local products and bear characteristic Solid and Hachure B designs in iron oxide paint.

Four bowls, all of Chaco Canyon manufacture, came from Room 27, noteworthy for the number of its earthenware vessels. Three are decorated with iron oxide pigment: two in the familiar Hachure B style (pl. 22, *g*, *h*,) and one, *i*, in Solid. Despite its blackened lip, the first of these three, reflects northern influence through its better-than-usual external finish and parallel brush lines pendent $\frac{3}{4}$ of an inch on opposite sides. Finger-grip handles $2\frac{1}{2}$ and $1\frac{1}{4}$ inches wide, respectively, will be seen in *h* and *i*. Those on the former are cupped on the under side. The fourth Room 27 bowl is brown-with-polished black-interior (pl. 24, *c*).

In Room 32, in addition to the stone artifacts enumerated on page 25, we found four restorable bowls. Three are Chaco Canyon types (pl. 23, *c*, *e*, *f*); the fourth, a Chaco-San Juan. This latter (pl. 23, *d*), although ornamented with organic paint, has the wide-sloping sides and blackened lip of Chaco bowls. Furthermore, the rim is thinner and the lip less rounded than in more typical Chaco-San Juan vessels. Strap handles, pressed in at the middle and fused to the vessel wall, were attached $1\frac{1}{2}$ inches below the rim.

The three Chaco Canyon bowls from Room 32 are decorated with mineral paint and in three different but contemporaneous styles: Hachure A (pl. 23, *e*), Degenerate Transitional, *f*, and Hachure B, *c*. On the first of these, three parallel $\frac{1}{4}$ -inch-thick rolls of clay, pressed in at the middle, form double-loop handles. The pigment employed on *f* is largely of a reddish hue—the result either of some peculiarity of the mineral, improper preparation, or carelessness in firing.

Room 39 was one of those utilized as a dumping place. In the 4 feet of blown sand and floor sweepings that had accumulated before the ceiling fell we found a number of stone artifacts and 10 restorable earthenware vessels, including 6 bowls. Three of these latter (pl. 23, *g-i*) are decorated with mineral paint in Solid style. Their rim edges are painted black, but only on the smallest is a line break positively identifiable. The other three, *j-l*, fall in our Chaco-San Juan classification, although *k*, in design composition and surface treatment, more nearly approaches Classic Mesa Verde ware. Organic paint was used on all three. The lip of *j*, although somewhat flattened, is blackened

after Chaco Canyon custom while the other two have rounded rims, ticked at short intervals.

Among the 1,256 miscellaneous potsherds tabulated from Room 39 is a bowl fragment decorated inside and out with dissimilar, rectilinear Hachure B designs (fig. 24). The design on the inside was less carefully drawn and with thinner paint. Paired holes, perhaps for a carrying cord, were punched through while the clay was still plastic. Two fine Hachure B pitchers from Room 39 are shown on plate 28, *i*, *k*.

Room 43 was another dumping place from which we removed an assortment of stone implements but only two restorable pieces of pottery, both bowls. One of these is the small black-on-white porringer seen on plate 23, *b*. In typical Chaco-San Juan style it is slipped inside and for half an inch below the outside rim, decorated with organic paint and carefully burnished over the decoration. The rounded, slightly-incurved rim was ticked, and some of the paint was allowed to run down irregularly over the slip band. Three conical, unperforated lugs segment the upper outside wall.

Our second Room 43 bowl is that on plate 54—black-on-red inside and thick red-on-creamy-white outside. It was an import from the Houck area, east-central Arizona (Roberts, 1932, p. 112). Morris (1917, p. 179) found a companion bowl in Aztec Ruin. Trade in pottery and in the materials for pottery manufacturing, and gifts from visiting friends are age-old Pueblo customs.

Architecturally, Room 44 was one of the most interesting in the pueblo. It had three successive occupancy levels, the last two separated from their predecessors by purposeful fills of sand and household rubbish. Discarded artifacts and potsherds were collected from each fill but only one restorable vessel, the pitcher shown on plate 28, *h*.

Three bowls recovered above the third and final floor in Room 44 merit comparison. One is a typical Chaco-San Juan specimen—dark-gray organic paint, flattened rim closely ticked, and a band of thin slip outside (pl. 24, *a*). A companion piece, *b*, has the characteristic Chaco finish and tapered rim but without the traditional black rim-line. On one side, pressed so close as to leave no opening behind, is a pair of luglike strap loops, more decorative than useful. On either side of these loops there remains an inch-wide smear of thin, black, nonmetallic paint—the only trace of pigment on this particular specimen. The bottom is much flatter than on the average Chaco bowl. Drilled holes evidence ancient repairs.

A third bowl from late debris in Room 44 is illustrated on plate 25.

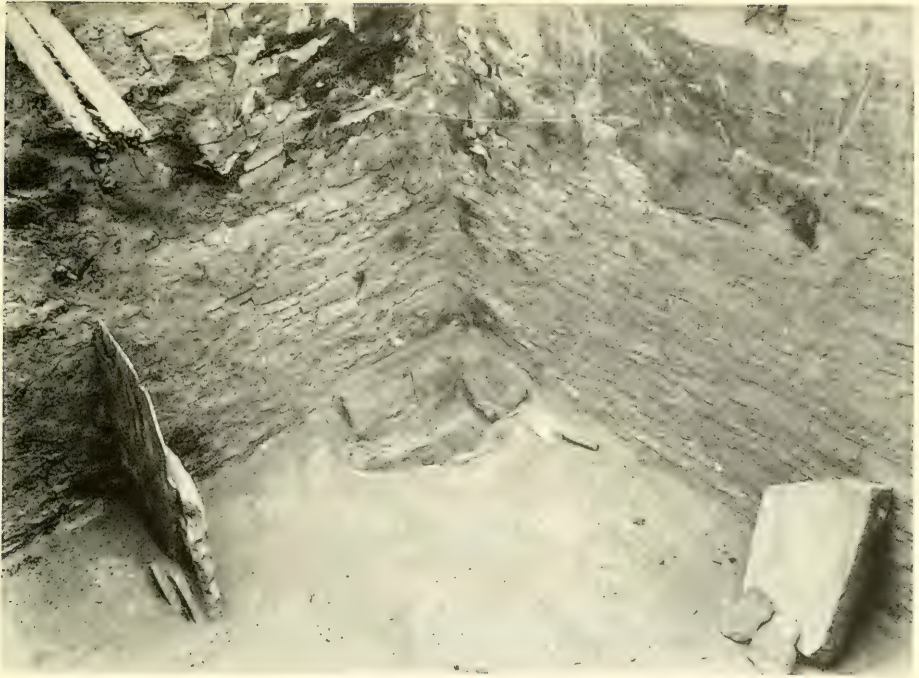
It is brown with glossy black interior, stone polished inside and out. It is slightly flattened on the bottom and has a rounded rim. Our prime interest, however, is in its ornamentation—a linear design in matte paint that is typologically much older than the surroundings in which the fragments were found. We do not know just when and where this peculiar watery sort of pigment was first employed, but 800 years or more after Pueblo del Arroyo fell into ruin Maria and Julian Martinez of San Ildefonso pueblo rediscovered the secret of its preparation (Guthe, 1925, p. 24).

Our bowl had been broken while in use, repaired, and again broken. We recovered its fragments from four separate rooms—the major portion from 44, lesser sections from 39, 43, and 47. Five ceiling timbers from these four dwellings gave cutting dates between A. D. 1066 and 1086. Fragments of similar vessels were unearthed during our explorations at Pueblo Bonito.

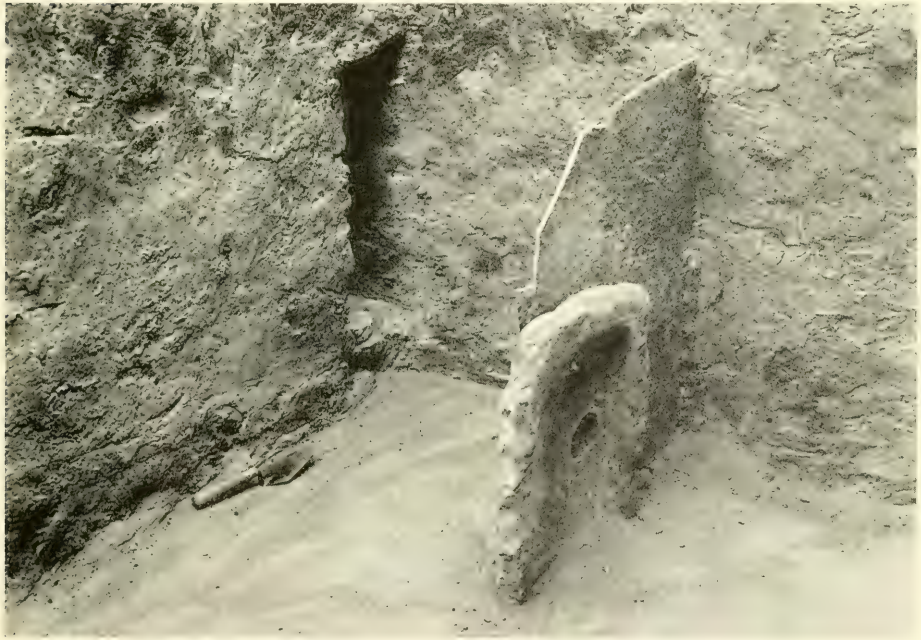
Because there were three successive floors in Room 44, each overlain by household debris, it is instructive to note the results of our sherd analysis. After eliminating all recognizable duplicates, Roberts and Amsden tabulated 969 miscellaneous fragments from the lowest fill and of these 17 were Chaco-San Juan types and 664 Corrugated-coil culinary ware. Of 2,326 sherds from the second fill, between the second and third floors, 46 were Chaco-San Juan and 1,486 Corrugated-coil; of 2,820 sherds in the late fill above the third and last floor, 226 were Chaco-San Juan and 1,580 were Corrugated-coil. The makers of these two wares obviously were increasing in numbers or productivity during the years Room 44 was occupied.

Five more bowls may be cited: four of Chaco-San Juan type (pls. 22, *a-c*; 23, *a*) and the fifth a small local specimen with Hachure B curvilinear design (pl. 23, *c*). The large bowl (pl. 22, *b*) is the only restorable earthenware vessel recovered from Kiva F, a Chaco-type ceremonial structure that had been remodeled to meet northern requirements and thereafter was stripped of its timbers and briefly utilized as a repository for neighborhood rubbish. In connection with this remodeling and subsequent abandonment, it is pertinent to note that we collected from the Kiva F rubbish 1,729 miscellaneous potsherds among which Roberts and Amsden counted 301 of Chaco-San Juan type and 8 of Classic Mesa Verde.

Part of an oval, flat-bottomed brown bowl with black interior, stone polished inside and out, was recovered west of Pueblo del Arroyo, outside Rooms 42-49 (U.S.N.M. No. 334677). Pepper (1909, p. 211) reports a similar but slightly larger bowl, with corrugated exterior, from Room 33, Pueblo Bonito.



A. Northwest corner fireplace, Room 3.



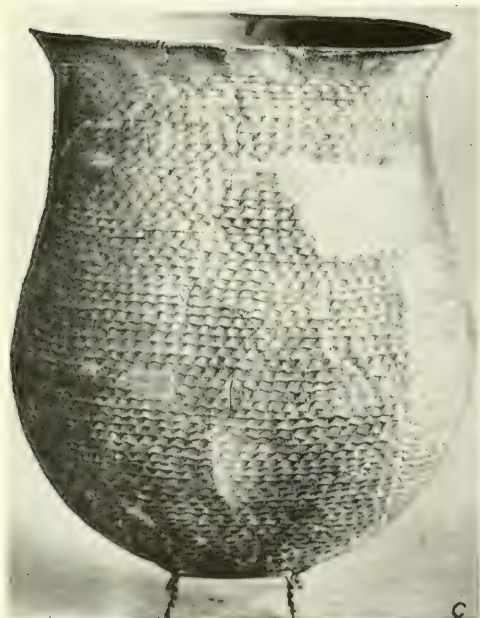
B. Fire screen and ventilator, southwest corner of Room 3.
(Photographs by O. C. Havens, 1923.)



a



b



c



d

PLATE 47. Two bowls from Room 5 (*a, b*) and Corrugated-coil pots from Room 3 (*c, d*).

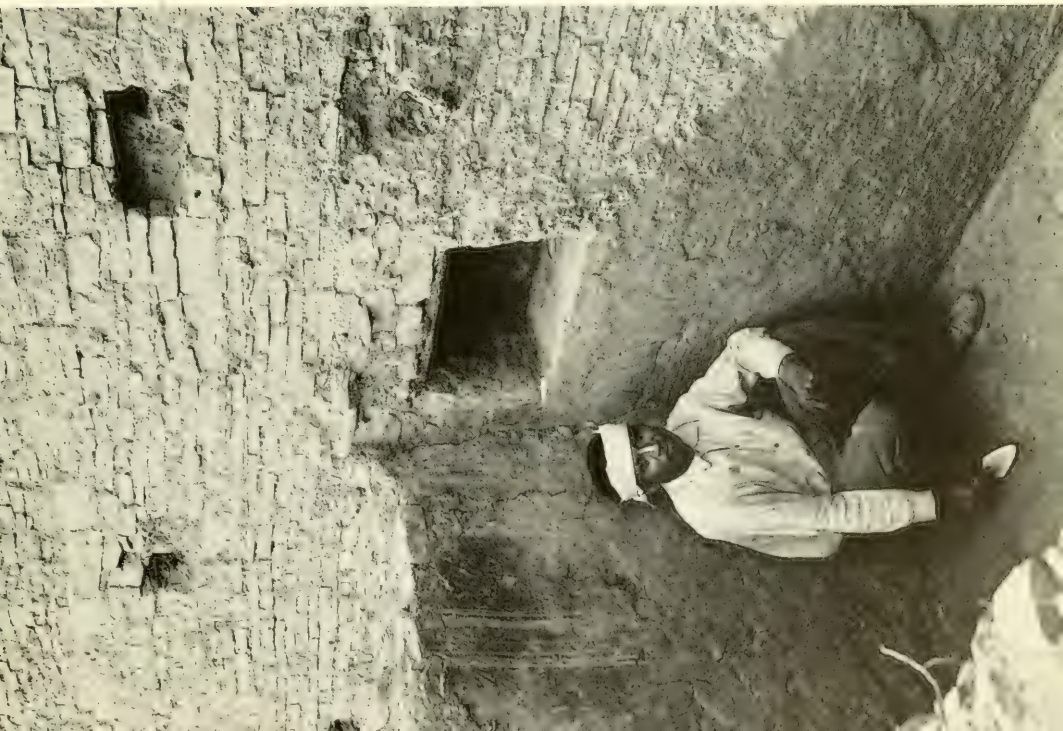
PLATE 48

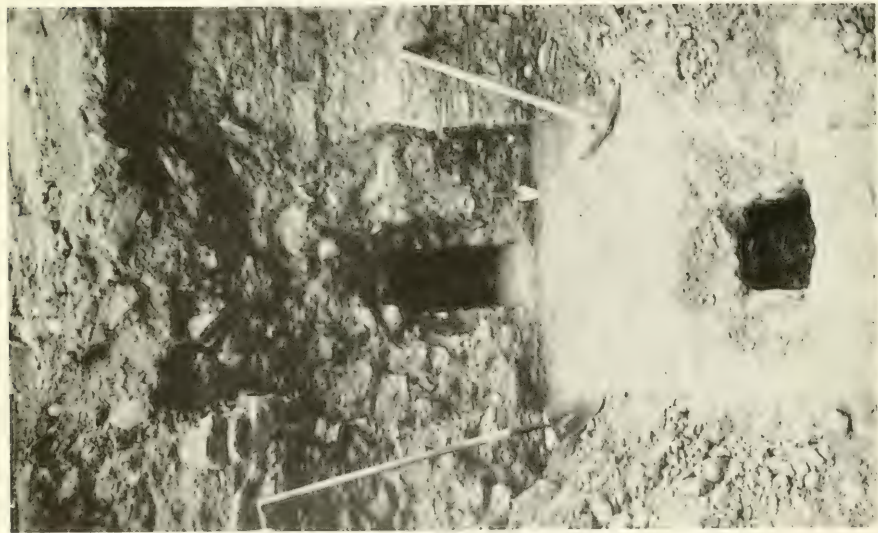
Left: North-wall recess in Room 4 and, to the right of it, seating for the single ceiling beam. The upper rectangular openings held the ends of paired beams extending through from Room 9A.

(Photograph by O. C. Havens, 1923.)

Right: Milling stone in its slab-walled bin, Room 5. Room 4 beyond.

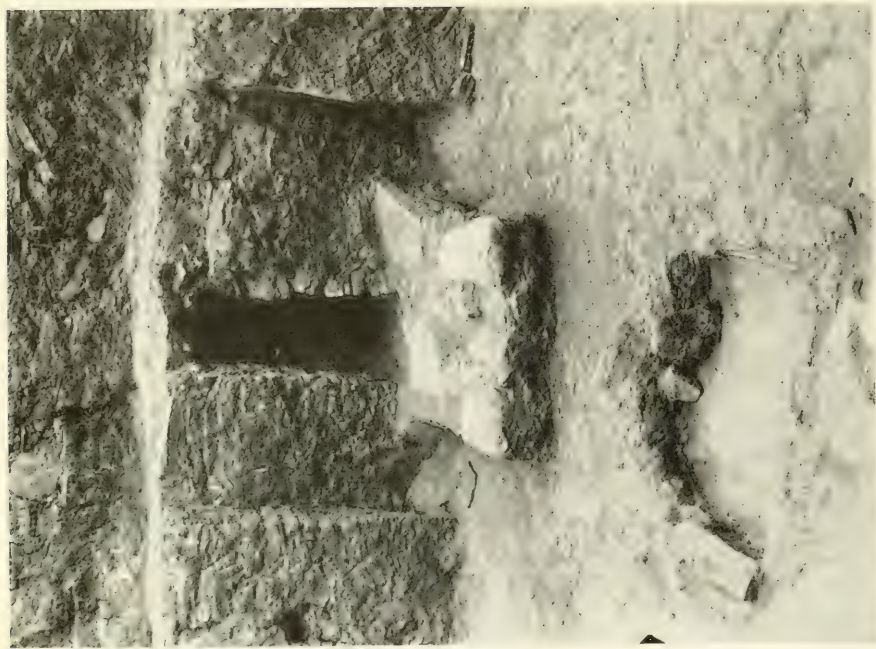
(Photograph by Neil M. Judd, 1923.)



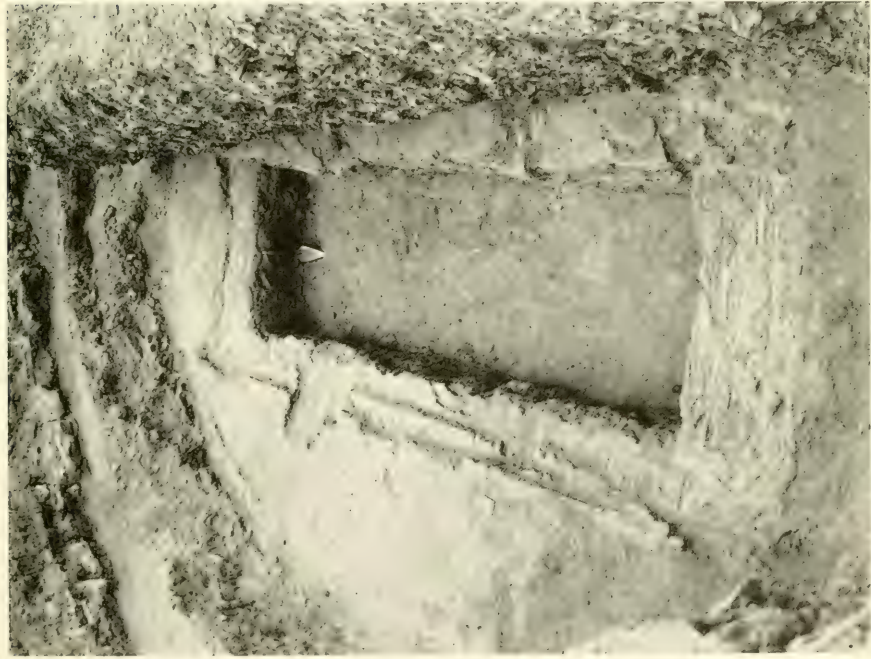


A. South recess and blocked subfloor ventilator duct
(foreground), Kiva I.

(Photograph by Karl Ruppert, 1925.)



B. Fireplace, south recess, ventilator, and platform in Kiva B.
(Photograph by O. C. Havens, 1923.)



A. The subfloor vault in Kiva "c" as seen from the south.
(Photograph by Neil M. Judd, 1926.)



B. Covered outside ventilator shaft for Room 3. Above, two empty holes once held poles tying the later stonework to the west buttress.

(Photograph by O. C. Havens, 1923.)



PLATE 51

Upper: Excavations west of Pueblo del Arroyo revealed the foundations of a triple-walled McElmo Tower.

Lower: Fireplace, screen, and covered south ventilator in Kiva "b."

(Photographs by Neil M. Judd, 1926.)





A. A mass of rubble built over two rude walls between Kivas "c" and "d" provides an unsolved puzzle.



B. Mr. Ruppert examines stratified accumulations against the outer west wall of Pueblo del Arroyo.

(Photographs by Neil M. Judd, 1926.)



PLATE 53.—Three Hyde Expedition photographs showing Jackson's "old arroyo" and what is believed to be part of the silt-covered Pueblo del Arroyo trash pile.

(Courtesy of Dr. Harry L. Shapiro and the American Museum of Natural History.)

Figure 25 shows an "eagle" as part of the black-painted ornamentation on the brick-red floor of a bowl sherd from south of the Little Colorado River, perhaps the Petrified Forest area. The fragment is slipped inside and out; externally, a distinct red slip wash comes well down over a cream-colored slip that covers the flattened bottom and lower sides. Coarsely ground sherd temper is visible in the blue-gray paste.

Ladles.—Four of the five ladles recovered from the wreckage in Room 27 are shown on plate 27. Figure *b* is a hollow-handled, Chaco-San Juan type decorated with organic paint and a careless outside rim band of white slip. Five dots appear on the lip above the handle, and six more lie on the lip opposite; between the two groups is another lot of five. The lip opposite this latter group has been worn away, erasing its balancing series of dots.

Three of the Room 27 ladles are of the old P. II half-gourd form: one dark brown with polished black interior (pl. 27, *f*) and two smaller examples ornamented with mineral paint in Transitional style, *g*, *h*. A fifth Room 27 ladle, if it can be so termed, is the 3-bowl creation shown on plate 26, *a*. It is of a reddish-brown ware, slipped and stone polished but unevenly modeled and undecorated. The handle, flattened above and below, expands to either side beneath each bowl; the bowl lips are flattened and unpainted.

A hollow-handled ladle and two ladle bowls were restored from fragments found in the trash above the latest floor in Room 44 (pl. 27, *a*, *c*, *d*). Four holes in a downcurving arc were punched through one side of the handle of *c* and two on the opposite side. A horizontal ring is missing from the handle end. This specimen and one of the bowls, *d*, are finished and decorated in Chaco-San Juan style, while the second bowl, *a*, follows Chaco Canyon practices.

A black-on-red ladle with hollow handle from Room 32 (pl. 27, *e*) is ornamented with mineral paint, including the black line around the lip. In restoring this specimen we replaced the handle ring.

Largest scoop-type ladle in the collection was recovered in Room 39 (pl. 27, *i*). Its full-length design and black rimline are in mineral paint. In contrast, a miniature (pl. 27, *j*) found among late debris at the east end of the Kiva "d" enclosure, and likewise decorated in mineral paint, lacks the rimline. Part of an unusual Chaco-San Juan ladle handle, solid throughout, white slipped and beautifully polished (fig. 23), was recovered from the same rubbish heap; also, the end of a white-slipped, longitudinally perforated handle that could be mistaken for a pipe mouthpiece were it not for the holes punched through the upper side (U.S.N.M. No. 334677).

Two other ladle handles, both stone polished and bearing organic paint, may be noted. One (U.S.N.M. No. 334562) is solid, $5\frac{3}{4}$ inches long by $\frac{7}{8}$ inch wide and $\frac{1}{2}$ inch thick, with two tail-like appendages curled up over the distal end and four holes punched through vertically. The second fragment (No. 334678) measures $3\frac{5}{8}$ inches long by $2\frac{1}{8}$ inches wide by $\frac{3}{8}$ inch thick and thus recalls the broad handles on certain ladlelike vessels from Pueblo Bonito (Judd, 1954, p. 202). Irregularities on this second piece, top and bottom, have been abraded away and so, too, the broken end. A bold checkerboard in black organic paint enlivens the upper surface. Found in Room 9B-II, the fragment presumably served as a toy.

Two perfectly absurd ladles were recovered in fragments at bench level on the east side of Kiva C (pl. 26, *b*, *c*). Both are decorated with iron oxide paint in Hachure B style. Their original length may only be surmised, but we have restored no more than 1 inch on the longer and less than that on the under side of the second. Considering their similarity in other particulars, I assume the two were originally of equal length or nearly so. The handle alone on *c* is $14\frac{5}{8}$ inches.

Pitchers.—We have only seven specimens to represent all the pitchers made and used at Pueblo del Arroyo. Five are of local manufacture, the other two are Chaco-San Juan types, decorated with organic paint. One of these latter (pl. 28, *j*) is slipped and stone polished; its rim, mostly restored, has three broad ticks above the handle. In our restoration we have allowed a concave base. The second Chaco-San Juan pitcher, an offering with the Room 40 burial (pl. 24, *e*), is less carefully finished but it has the customary concavity on the bottom.

Our five Chaco Canyon pitchers, each cupped on the bottom, are ornamented with mineral paint but in as many different styles. The two from Room 39 (pl. 28, *i*, *k*) are alike in shape and decoration but the design on one is zoned while that on the second is in an all-over pattern. On each the handle is concave transversely. Figures *f*, *g*, plate 28, are later types, both in form and finish. The work of a tyro, *h*, was found in the southeast corner of Room 44, in the 17-inch accumulation separating the second and third floors.

Squash pots.—So called because, as Morris (1939, p. 144) suggests, the form obviously originated in a pumpkin or squash from which the stem had been cut away, leaving a hollow vessel with a slightly depressed, rimless opening. "Seed jar" is a synonym frequent in archeological literature. In B.M. III times squash pots were commonly used over the fire; from P. I onward they were nonculinary and customarily decorated.

Our Pueblo del Arroyo collection includes five black-on-white squash pots, or seed jars, and four of redware. They vary in diameter from $3\frac{1}{2}$ to $11\frac{3}{4}$ inches. The two largest (pl. 29, *d*, *e*), both from Room 27, are of Chaco-San Juan type and ornamented with organic paint. On the first, surface finish is noticeably inferior to that of the second, but its basal concavity is four times as deep. The other three black-on-white specimens, *a-c*, were decorated with mineral paint although the design on *a* is barely traceable. Both *a* and *c* were provided with flat bottoms, but the base of *b* is deeply cupped.

Of four redware seed jars (pl. 29, *f-i*) the first three were treated with a thin red slip and stone polished; horizontal striae left by the polishing stone show clearly. The first is flattened on the bottom, the next two rounded. Figure *i* was both slipped and carefully smoothed, but it lacks the visible toolmarks and the luster of the other three. Under its slip the paste is dark gray all the way through. The vessel is plainly overfired; its bold, black pigment has not been identified.

As to color, the first, *f*, and third, *h*, are a reddish brown; *g* and *i* are of a brighter, livelier red. The first, browner below the waist, wears above its middle a design in thin brownish-black pigment, presumably iron manganese, applied before polishing.⁹

One might find the ancestor of these nine vessels among the seed jars Roberts (1930) recovered from Pueblo I ruins in the Piedra district of southwestern Colorado or among those described by Morris (1939, p. 161) from La Plata Valley, 50 miles farther west. After P. I times, squash pots lost their popularity along the La Plata, and redware was "almost absent" in Early P. III (Morris, *ibid.*, pp. 206, 212).

"*Kiva jar*" is a term proposed by Kidder (1924, p. 62) for a special form of earthenware vessel, examples of which had previously been found in San Juan area kivas. Because their shape is similar, kiva jars and squash pots are obviously close relatives, but instead of the depressed rimless mouth of the latter, the kiva jar is provided with a flange for support of a discoidal cover and a rim that rises outside and above the flange. Kiva jars are customarily attributed to the proto-Mesa Verde and Classic Mesa Verde cultures.

At Pueblo del Arroyo we recovered only one fragment of a kiva jar, a $\frac{5}{16}$ -inch-thick white-coated but unslipped, coarsely sherd-tempered piece decorated outside above flange level with a curvilinear

⁹ I must admit my lack of success in matching the burnished surfaces of these and other redware vessels with Ridgway's standard colors. All seem to fall in his orange-red series, tones *i* and *k* (Ridgway, 1912).

design in iron oxide paint (U.S.N.M. No. 334680a). The remaining arc of that design represents a circle at least 2 inches in diameter, and the rim must have stood a bit higher. Pepper (1920, p. 124, fig. 48, b) illustrates a low-rimmed kiva jar from Room 32, Pueblo Bonito.

Canteens.—Five specimens are before us, no two alike (pl. 28, *a-e*). Diameter varies from 6 to $8\frac{1}{4}$ inches; height, from 5 to $6\frac{3}{4}$. Loop handles high on the shoulder for a carrying cord occur on four specimens; knobbed handles on the fifth.

Plate 28, *c*, of Chaco-San Juan surface treatment and decoration, was restored from fragments recovered in Rooms 2 and 3 south of the pueblo. It has the low, squat profile, the concave base, and the triangular scroll design common to northern canteens. The others are all ornamented with iron oxide paint. Plate 28, *a*, one of three unbroken vessels in the entire collection, found on its side, orifice close in the southeast corner of Room 65, bears a Degenerate Transitional pattern; Hachure B appears on *b* and *c*, however indistinctly in the latter case. Each has a concave bottom except *d*, which is somewhat flattened.

Cylindrical vases.—In contrast to the numbers unearthed at Pueblo Bonito, only one black-on-white cylindrical vase is known from Pueblo del Arroyo (pl. 24, *f*). It leans a bit to one side; its simple Hachure B ornamentation is divided into two zones by a plain band occupied by four upturned loop handles.

In addition to that just described three redware vases were restored from fragments found in Room 15 (pl. 55). Each is flat bottomed with a basal diameter about half that at the rim. Each is coated with a thin red slip that was stone polished to the point of lustrousness, inside and out on the first (left figure), and to a less degree on the inside of the other two. Longitudinal channels left by the polishing stone remain visible upon the outer surfaces of all three, encircling striae within. None of the vases is decorated; none has handles or perforations for suspension cords.

The first, 6 inches in diameter at the rim and $3\frac{1}{4}$ inches on the bottom, has a height of $9\frac{1}{2}$ inches. The bottoms of the next two have been restored but their indicated heights are $10\frac{1}{4}$ and 10 inches, respectively; their rim diameters, $6\frac{5}{8}$ and $6\frac{1}{4}$ inches. Spalled surfaces and leftover sherds show pastes varying from gray in limited areas to reddish all the way through. On the basis of two small fragments submitted, Miss Anna O. Shepard reports a sherd temper with "a noticeable preponderance of white paste particles" plus "a scattering of well rounded quartz grains."

Despite a predominantly sherd temper our three redware vases from Room 15 are unique in Chaco Canyon. In surface treatment if not in color the two associated squash pots (pl. 29, *g*, *h*) are identical with these vases. Origin of the five remains unknown.

What may be the fragment of a vertical-walled vase, white slip washed inside and out but unpainted, was found in the general digging. Its rim is thinned from the outside and the lip rounded; indicated inside diameter is about $5\frac{1}{2}$ inches. The unusual feature of this fragment is that its exterior had been horizontally incised at $\frac{1}{8}$ -inch intervals with an awl or like pointed tool prior to being whitened. Paste is uniformly light gray throughout; sherd, quartz grains, and dark rock particles are visible as temper.

Water jars or ollas, 15 in number (including two unrestored fragments) vary in maximum diameter from $6\frac{3}{4}$ to $19\frac{3}{4}$ inches. Height, bottom to base of neck, varies from about $6\frac{1}{2}$ to $18\frac{1}{4}$ inches. In each case where the bottom is intact it is concave. Of six necks present and measurable, height of five is $1\frac{1}{2}$ inches; of the sixth, $1\frac{3}{4}$. Rims, usually with a slight flare, range from $2\frac{1}{4}$ to $9\frac{1}{4}$ inches in over-all diameter. The largest orifice occurs on an olla foreign to Chaco Canyon (pl. 31, *a*).

Comparatively small mouths and short necks identify this group as vessels for transporting or storing water. Omitting one of the unrestored specimens (neck and shoulder only), 2 of our 15 ollas are provided with lugs for lifting or for embellishment, 2 have horizontal strap handles at or below maximum diameter, 3 are equipped with inset fingerholds, and 7 have no handles at all. Their individuality in other respects is readily apparent from the illustrations.

Two water jars from Room 15 differ in size and decoration but both were provided with inset handles just below greatest diameter (pl. 30, *a*, *b*). Both bear zoned ornamentation in iron oxide paint, but that on the first is in Degenerate Transitional while that on the second is in contemporary Hachure B. Neither neck was recovered; the broken edges were not tooled. As restored, the bottom of this latter was left concave but within an erroneously flattened area.

Six Room 27 jars provide an even more interesting comparison (pls. 30, *c-f*; 31, *a*; 32, *b*). All were recovered between 2 and 3 feet above the floor, clearly fallen from the second story. All were decorated with iron oxide paint except figure *e*, plate 30, which is stone polished over a design in nonmetallic pigment. When painting this vessel, the potter first outlined the checkerboard frames and individual negative squares; the dotting and filling-in followed. The base

is concave. Strap handles immediately below maximum diameter were pressed tightly against the wall for more than half their length, leaving protuberant ends.

Figure *a*, plate 31, is unquestionably a stranger to Chaco Canyon. It is slightly indented on the bottom, but its sloping shoulder, wide mouth, and outflaring rim are not to be seen on any other jar in the collection. Its design, in iron oxide pigment on a well-smoothed surface, is reminiscent of that on a bowl from Room 266 at Pueblo Bonito and I would guess the two came from the same distant but still unknown village. Two hornlike lugs below the rim, their pointed ends turned counterclockwise and touching the neck, were finger lifts more decorative than useful. Broader lugs (pl. 30, *d*), cupped on the under side, seem more practical as handles.

Among the restorable vessels recovered from household rubbish in Room 28, or perhaps fallen from the second story, are the two great ollas shown on plate 31, *d*, *e*. Both were decorated with mineral paint, the first in a rusty-brown Degenerate Transitional pattern on an unslipped, hand-smoothed surface; the second in a Transitional design over a highly polished gray slip. Inset handles or finger grips appear on the first; no handle of any sort on the second. In our restorations we erred—to judge from other ollas in the collection—in making both bottoms round instead of concave. The neck of figure *e*, plate 31, had been broken out and the irregularities abraded away to leave a 10½-inch orifice. So altered, the vessel was still serviceable for storage purposes.

Two other ollas from Room 28 were found to be incomplete when unpacked in the Museum laboratory: (a) our smallest, 6¾ inches in diameter, upper third missing, concave base, decoration an unsure Hachure B or C over a polished slip (U.S.N.M. No. 334563), and (b) the neck-and-shoulder fragment mentioned above (No. 334566), with a bold Hachure B design.

A restored water jar from Room 51 (pl. 31, *c*) is a colossus among Chaco Canyon pottery. In size, 19¾ inches in greatest diameter by 18 inches in height from concave bottom to base of neck, it surpasses every other jar revealed by our excavations. The maker of that enormous vessel must have been proud of her creation but, once finished, it was not often moved. It lacks handles; it is bulky even when empty; it would barely pass through existing doorways. In our restoration we merely suggested the cylindrical neck which very likely was between 2 and 3 inches high.

A second Room 51 olla, likewise with neck missing, is shown on plate 31, *b*. Its ornamentation, in a brownish-black pigment, is in a

fine-lined, boldly framed, over-all rectilinear hachure I would classify as C. The design is carried well down the side, an apparent characteristic of late hatching. Handles are heavy straps, slightly indented, placed below maximum diameter and carrying an appropriate portion of the decoration. In restoring this specimen we have again erred in providing it with a flat, rather than a cupped, base.

The design on figure *a*, plate 32, is a composite that does not look Chacoan although the pigment is an iron oxide over a lightly slipped, well-smoothed surface that is decidedly local. The fragments were recovered from Rooms 43 and 44.

It is a curious fact that, while we recovered 13 restorable water jars at Pueblo del Arroyo, only 4 were unearthed at Pueblo Bonito, residence of a much larger population.

Culinary ware.—The 25 cook pots recovered at Pueblo del Arroyo are shown on plates 32, 33, 34, 47. All have been restored: 2 from Room 3, abutting the outside south wall of the pueblo, 3 from Room 27, 1 each from Rooms 15 and 64, and 18 from Room 65. As a group they average 3 inches larger, both in diameter and height, than 29 like vessels we exhumed at Pueblo Bonito and their rimflare is more evident.

One-story Room 65 obviously was last used for storage, since 12 pots were ranged along its walls, 5 on the north side and 7 on the south (pl. 14, A). Several stood upright; others, bottom up. All were crushed when the ceiling fell in and then, after still useful timbers had been salvaged, the resultant depression became a neighborhood dump. From this rubbish we collected fragments of six more cook pots.

These 18 Room 65 vessels differ appreciably in shape and size, as will readily be seen from the illustrations and from the measurements given in Appendix A. Those standing on the floor (pl. 34, *a-l*) vary in maximum diameter from $9\frac{3}{4}$ to $14\frac{1}{4}$ inches; in height, from $10\frac{3}{4}$ to 17 inches; and in over-all diameter at the mouth, from $7\frac{5}{8}$ to $11\frac{7}{8}$ inches. In contrast, the six recovered from the overlying household debris (pl. 33, *a-f*) vary from $7\frac{5}{8}$ to $12\frac{3}{4}$ inches in diameter, from $8\frac{1}{8}$ to 15 inches in height, and from $5\frac{1}{8}$ to $12\frac{1}{4}$ inches in rim diameter.

The third vessel in this second group (pl. 33, *c*), with its shortened rim and plain base, had been rubbed over before its corrugations were entirely dry. This is also true, but less noticeably, of one of those from the floor (pl. 34, *d*). A companion pot, plate 34, *a*, had been smoothed with a moist hand until its coiling was half obliterated.

Where they occur, handles on these 18 pots likewise differ. Solid,

downturned lugs or finger grips occur $2\frac{1}{2}$ inches below the lip on opposite sides of figure *k*, plate 34. Similar grips, somewhat flatter, lie $1\frac{3}{4}$ inches below the lip of *b*. On one side of *d* a small solid lug, its end turned to the right, lies $2\frac{1}{4}$ inches below the lip, while on the opposite side of the neck is a wider finger grip, punched through from above. The solid loop handles on figure *e*, attached by the riveting process, and slightly indented, are unique in this collection. Again, one of the six pots from the overlying trash pile (pl. 33, *e*) has a pair of conical nodes, $\frac{1}{4}$ inch long and an inch apart, positioned $1\frac{1}{4}$ inches below the rim on one side of the neck with nothing opposite by way of balance. Clearly these were only decorative. The large pot with unusually wide mouth and throat (pl. 33, *f*) looks to me more P. II than P. III.

It would be instructive to learn whether these two lots differ in tempering materials as much as they do in size and outward appearance. Lacking the means for thorough analysis, I have depended upon a 10X lens. With this I recognize grains of rounded quartz sand in both lots and angular bits of crushed rock. Undoubtedly our Pueblo del Arroyo pots were variously tempered as were those at Pueblo Bonito where Miss Shepard (1939, p. 280) found sanidine basalt, directly or indirectly, in a noteworthy proportion of culinary ware. It is her belief that the presence of this unusual rock in Chaco Canyon pottery is evidence of trade from the Bennett Peak district, 50 miles to the west, where corrugated ware was a speciality and where sanidine basalt was the customary temper.

Temper is the most important diagnostic in analyzing corrugated pottery. Structural variations such as coil width, depth of corrugations, embellishment, and presence or absence of handles seem to me more indicative of potter preference—and perhaps only a fleeting preference at time of manufacture—than of established practices that may measure cultural or time advances.

With few exceptions our 25 corrugated pots, irrespective of size and shape, would have been equally at home in almost any other Pueblo III ruin throughout the San Juan country. Only the tall vessel with plain body and broad, smoothed-over coils on neck and shoulder and downturned lug finger grips high on the sides (pl. 34, *k*), seems out of place in this assemblage. With this exception and perhaps the two next to follow, every cook pot in the collection comes between the extremes of what Morris (1939, p. 196) regards as the "standard" early P. III corrugated jar.

The squatter, more globular of the Room 65 pots (pl. 34, *e*) and the lone example from Room 15 (pl. 32, *d*), each with high, rounded

shoulder, constricted orifice, sharply recurved rim, and manipulated coiling far superior to that on any of the others, are superb examples of the prehistoric potter's art. Both are probably to be identified in point of time with the Mesa Verde phase of Pueblo III culture.

A small, coarsely coiled vessel from Room 27 (U.S.N.M. No. 334647) was not included in the foregoing review because it did not seem to belong. It is not sooted; has never been on a fire. Its globular body and flaring rim suggest affinity with the two squat vessels from Rooms 15 and 65 considered in the previous paragraph. Its coiling is counterclockwise; thumb or finger indentations are infrequent; coils are uneven and curled at the outer edge as though formed by a dragging finger on a too-firm paste. A strip of clay, now missing, had been pressed handlewise flat against the topmost coil. Overfiring is evident.

A final corrugated specimen is the redware vessel seen on plate 32, *c*, restored from fragments gathered from floor sweepings dumped into Room 39. Its neck had been broken while in use and the irregularities leveled by abrasion. Coils average six to the inch and were smoothed by scraping.

Feather box (?).—We have no pigeonhole into which to fit the rectangular vessel seen on plate 24, *j*. Its slaty-gray slip is decorated with vegetal paint and stone polished over all. Its bottom is flat and its sides slant upward and inward to a flat-rimmed, rectangular opening that averages $2\frac{5}{8}$ by 4 inches. At either side of this opening paired holes an inch apart, punched through from the under side, presumably were the means for securing a cover. The vessel obviously was a receptacle for treasured objects, perhaps feathers. It has the feel of a Classic Mesa Verde piece.

Bird-shaped bowl.—The small, bird-shaped container with iron oxide pigment in a Degenerate design (pl. 24, *h*) is the only one of its kind in the collection. A tau-shaped opening occupies almost the entire back; the ornamentation overlies a thin white wash; the concave bottom is not slipped. The vessel was found in the southwest corner of Room 27 about 3 feet above the floor and among wreckage of the second story.

The tail from a similar vessel, decorated in Hachure B, was recovered from a pile of late rubbish outside the west wall of the pueblo, opposite Rooms 42-49. Here, also, was a second bird-shaped bowl fragment—a flat, tail-like piece painted above and below with brownish-black pigment and polished. It is $1\frac{3}{8}$ inches long by $1\frac{1}{8}$ inches wide by $\frac{1}{4}$ inch thick—too long and too thin to be a bowl handle.

In this same late rubbish west of the pueblo we found two fragments of a redware double bowl, one half black inside and the other red. It was burnished inside and out but otherwise undecorated. Bits of pulverized sherd, numerous white particles, and quartz sand grains in the paste are visible under a 10X lens. In surface finish also the fragments parallel the three redware vases from Room 15 (p. 156).

Figurine fragments.—From the late rubbish pile outside and west of Rooms 42-49 we recovered seven fragments from six earthenware figurines of human form and what may be the leg of a bear effigy (pl. 36, A). This latter, with a broad toeless foot and short shin, is twice ringed about in iron oxide paint over a thin white slip. Two other fragments are also mineral painted, front and back. They are the shoulders of, apparently, a single figurine despite the fact that one piece is a little smoother than the other. Both are of a gray paste, thinly slip washed, and well fired; the arm stubs are solid.

Of the five remaining fragments—two small feet tooled between toes, a head fragment preserving the left ear and cheek, a braceleted right forearm, with hand cupped to rest upon a rounded knee, and a lower left leg—all but the latter are decorated with a brown to dull-black pigment that does not respond to my magnet. All but two are stone polished. The last fragment, flatfooted and its toes lightly indicated by incising, is from a figure seated with knees elevated and calf free from thigh; the knee is unslipped where a cupped hand had rested.

The foregoing eight figurine fragments were all found in late household debris outside of the pueblo. Within the ruin we recovered only one comparable sherd (U.S.N.M. No. 334675) and that from rubbish dumped into Room 40. It is the $2\frac{1}{2}$ -inch-long fragment of a doubled right leg from a figure seated or squatting with heel against buttocks. The shin rises with a slight outward bend; the calf is pressed close against the thigh and the right hand is spread across just above the knee—a rather awkward position. Breakage occurred at the wrist, above the ankle, and at the union of thigh and torso. The broken ends have been partially abraded.

Among random sherds is a short left hind leg with broad rounded toe, vertically striped outside, at the rear, and underneath—the only fragment of a cloven-footed figurine in the collection (U.S.N.M. No. 334680a).

Earthenware effigies of bifurcated baskets.—Two restored specimens (pl. 35) found among second-story wreckage a couple of feet above the floor in Room 27, were briefly considered in my description

of comparable objects from Pueblo Bonito. Both have the vertical incurve, front and back, that appears to be a characteristic of Chaco Canyon bifurcated baskets and their earthenware representations. Both are thinly slipped, presumably sherd tempered, and ornamented with iron oxide paint. The larger was hand smoothed and the smaller, stone polished.

On each effigy the rim is painted black and is surmounted by a transverse loop attached inside at the rear. Each has been pressed in along the median line until the inner walls, front and back, almost meet; on figures *b*, *b'*, plate 35, this pressure has caused an open crack vertically in the upper half of the inside front wall. The larger of the two is hollow legged, the smaller is not. Both are equipped on the back with horizontally perforated lugs representing tumpline attachments.

A fragment that may be part of a larger basket effigy with a still more complex superstructure (U.S.N.M. No. 334677) was recovered from late rubbish at the east end of the Kiva "d" enclosure. As I interpret it, the fragment represents two loops, one rising above the other, arching across the rear width of the basket cavity. The loops are solid, $\frac{5}{16}$ inch in diameter and molded together at the back; they are slip washed except between their feet and where they were pressed and firmed together. A single black line adorns the face of the lower loop. Modeling at the rear is less finished, and a slight flare at the bottom of each leg suggests a basket with upcurving sides.

My tentative identification is prompted by a similar but smaller and previously undescribed fragment from the east refuse mound at Pueblo Bonito (U.S.N.M. No. 336065). This latter sherd consists of what I judge to be part of the right front rim of a basket effigy with a solid $\frac{3}{8}$ -inch roll molded to the inside and arching low across, and *outside*, the vertical groove that is a peculiarity of Chaco Canyon bifurcated baskets and their effigies. Part of a second and higher loop stands behind the first and is molded to it; the black rim line of the basket is continued across the base of the lower loop. There can be no doubt that the double loops of this second fragment were attached to the front rim of a basket effigy—the only instance of the kind that has come to my attention. In every other case the arching superstructure, if any, was molded to the inner rear wall of the effigy.

Miniature earthenware vessels such as that represented by figure 26 are made by modern Hopi potters, according to Katharine Bartlett (1934, p. 53), and left at clay pits as offerings to the spirits resident there. Our example, found in household rubbish, is fired but undecorated; a height and diameter of $\frac{3}{4}$ inch explain its want of symmetry.

The neck was added from the outside; there are no toolmarks visible within the $\frac{5}{16}$ -inch orifice.

A second miniature, larger and more successfully modeled, lay among debris of occupation near floor level in Kiva C (U.S.N.M. No. 334640). It is a bit lopsided, cupped on the bottom and undecorated. Measuring $1\frac{5}{8}$ inches in diameter by $1\frac{3}{4}$ inches high, the piece was burned and blistered by the fire that gutted the kiva following removal of its ceiling timbers.

Our third and final miniature (pl. 24, *g*) portrays a vessel with wide shoulder, low neck, and flaring rim. It is flat bottomed, thinly slip washed outside and within the rim, and ornamented by a black rimline and eight encircling lines on neck and shoulder.

Spindle whorl.—Half of an earthenware spindle whorl, $2\frac{1}{2}$ inches in diameter by $\frac{3}{16}$ inch thick, has a black-painted periphery and a half-inch-wide circle in Hachure B on each side (No. 334666).

Worked potsherds.—Among a small quantity of potsherds with abraded edges, eight are identifiable from the angle of wear as smoothers employed in pottery manufacture and one as a possible toy, the ring-ended fragment of a small Chaco-San Juan ladle handle, round and solid, worn off at both extremes. Four sherds are discoidal, $\frac{1}{2}$ to $2\frac{1}{8}$ inches in diameter. Of these four the two largest are fragments of black-on-red bowls, their edges on the concave side flattened by abrasion. Three smaller sherd disks from rubbish thrown over the west wall outside Room 48, one each of Hachure A and B and Early Black-on-red, are less discoidal and quite unabraded on the sides (U.S.N.M. No. 334662).

RECAPITULATION AND COMMENT

Roberts and Amsden, who conducted our pottery analyses, based their study upon the stratigraphy of two yard-square tests cut through 12 feet of previously undisturbed household sweepings underlying the West Court at Pueblo Bonito. With the exception of a few Pueblo I sherds all black-on-white fragments found in the lower 8 feet of that rubbish belonged in three stylistic groups: Transitional, Degenerate Transitional, and Solid. In the overlying 4 feet of that same stratified debris, however, in addition to sherds of the three groups just mentioned there were fragments of straight-line hatching and of Chaco-San Juan. Sherds of Corrugated-coil culinary ware were also recovered from the upper 4 feet but only those of Plain-banded cook pots below that depth. Clearly two distinct pottery assemblages separated at the 8-foot level.

The several pottery types identified with Pueblo Bonito occur also at Pueblo del Arroyo, although not in the same proportions. There were fewer sherds of Transitional, Degenerate, Solid, and Plain-banded culinary and more of the later types. The Chaco-San Juan was especially conspicuous both from excavated rooms and from the mound area west of the ruin, including remains of the McElmo Tower. If not the predominant local type, it was nearly so. Of 77,405 sherds tabulated by Amsden and Roberts 6,614, or more than 8 per cent, were Chaco-San Juan. No other black-on-white variety rated half as high. Only Corrugated-coil culinary fragments were present in greater number.

Sherds of Classic Mesa Verde were provide evidence of time and trade. After eliminating all recognizable duplicates Roberts and Amsden counted 930 such sherds at Pueblo Bonito but only 58 from Pueblo del Arroyo. Of these latter all but two were found in household waste that had been dumped into Kivas F, G, and J, each of which had been altered during occupancy to conform with northern tradition.

These divers data suggest that the inhabitants of Pueblo del Arroyo were closer, socially and economically, to the more recent portion of the population of Pueblo Bonito than they were to the older portion, and that Pueblo del Arroyo was first of the two villages to be vacated. The latest recorded bracket of tree-ring dates for the Mesa Verde cliff dwellings is A. D. 1019 to 1274; for Pueblo Bonito, 807+ to 1130 (Smiley, 1951, pp. 19, 22). Trade from the Mesa Verde came to Chaco Canyon late and continued at Pueblo Bonito after Pueblo del Arroyo had been abandoned.

The black-on-white pottery of Chaco Canyon has long been praised for its superior qualities. Kidder, first to analyze those qualities, pointed to "its very white, almost paper-white, slip and the unusually fine lines of its black decoration" (Kidder, 1924, p. 52). The tapered or rounded rim, the black-painted lip, and the line break were other conspicuous characteristics. The apparent conflict in form and decoration that puzzled Kidder at Pueblo Bonito is readily explained by the presence of P. II and P. III peoples as joint occupants.

Chaco Canyon black-on-white ware, from the Transitional to Hachure C, is generally hand smoothed, sherd tempered, and decorated with iron oxide paint. Some individual vessels are whiter and smoother than companion pieces, some are harder, some exhibit a coarser temper than others and even grains of sand or rock mixed with the ground sherd. Equal firing temperatures were not always

realized, hence pastes and surfaces vary in color. These dissimilarities are the natural consequence of a freehand process in which individual potters followed accepted but flexible processes. Shapes changed from time to time, but our several pottery types distinguish successive fancies in painted ornamentation rather than in form. Some of these fancies were short lived, others persisted for generations. They were at the same time sequential and contemporary. Present-day potters likewise have their preferences (Guthe, 1925, p. 78; Chapman, 1936, p. 15).

Our Chaco-San Juan group offers a different challenge. Like the local black-on-white series it is sherd tempered but is decorated with an organic rather than a mineral paint and polished over the decoration. From the first it appeared to embody Chaco techniques and northern designs, components that were sometimes elusive. Occasionally the decoration was done in mineral paint while designs and surface treatment followed northern custom.

As recorded by Roberts, Chaco-San Juan bowls have straighter sides than local bowls and thicker rims, variously ticked. Bowls, predominating in our collection, are usually unslipped or partially slipped outside but carry an interior, banded decoration framed above and below. Jars are globular with downraking handles and zoned ornamentation on body and neck. Pitchers have small bodies and long necks. Both pitchers and jars are indented on the bottom; mugs, which first appeared with the Chaco-San Juan, are flat based and slope sided. Ladles are all of the bowl-and-handle variety.

In shape, finish, and painted design our Chaco-San Juan group most nearly approaches the "proto-Mesa Verde" as initially described by Kidder (1924, p. 67). Decoration favors a repetition of such well-known elements as the fret, the interlocking key, stepped figures, and checkerboard—sometimes balanced by other units having the heavy, widely spaced type of Mesa Verde hatching. Together, the proto-Mesa Verde and our Chaco-San Juan equally foreshadow true Mesa Verde. Gladwin (1945, p. 149) regarded our Chaco-San Juan type as a "blending of Chaco designs and the Kayenta techniques of painting and polishing . . . from the region between Toadlena and Shiprock," but a northern affinity seems more likely to me.

Proto-Mesa Verde black-on-white is the pottery of Prudden's "unit type" structures (Prudden, 1903; Kidder, 1924, pp. 65-68). The mesas and valleys where those structures occur is likewise the home both of Mancos and McElmo black-on-white—names that appear repeatedly in the literature, the former more than the latter.

Mancos black-on-white was first described by Martin (1936, pp. 80-94) following researches at Lowry Ruin, southwestern Colorado. He described it as a chalky-white to gray ware, generally unslipped and unpolished. Bowls were flat, or sometimes round-bottomed, with direct rims and banded interior decoration including frets, solid or hatched figures, pendent triangles, and pendent lines reducing in length toward the left. Jars were globular with square shoulders, downraking handles and zoned decoration; ladles were of the bowl-and-handle form. Mancos, a sherd-tempered ware, was decorated with iron oxide paint. McElmo, on the other hand, was a carbon-paint type but also sherd tempered.

Colton and Hargrave (1937, p. 230) closely follow Martin but misread him in recognizing Mancos black-on-white rather than McElmo as synonymous with the proto-Mesa Verde. Mancos black-on-white is widely distributed throughout the San Juan country and beyond. It was the dominant type at Lowry Ruin (Martin, 1936, p. 94) and at the Turner-Look Site, 15 miles northwest of Cisco, Grand County, Utah (Wormington, 1955, p. 74). It occurred repeatedly, sometimes preponderantly, at small-house sites in Mancos Canyon, southwest of Mesa Verde National Park (Reed, 1944). From a 3-room house plus kiva identified as Unit 1, Site 13, on Alkali Ridge, southeastern Utah, Brew (1946, p. 199) reported "the black-on-white sherds were mixed Pueblo II (Mancos black-on-white) and Pueblo III (Mesa Verde and McElmo black-on-white) types with the latter predominating." Again, summarizing the subject for Alkali Ridge, Brew wrote (*ibid.*, p. 285): "The Mancos was technically advanced and had begun to show Mesa Verde features. The Mesa Verde was for the most part of the kind that could be called McElmo."

Nearly all who have written of Mancos black-on-white have remarked its close affinity with McElmo black-on-white and the "Chaco-like" qualities of both.

During his initial work at Lowry Ruin Martin was perplexed by this resemblance and "sometimes found it difficult to decide whether a sherd was Mancos black-on-white . . . or Chacoan" (Martin, 1936, p. 112). Reed, after balancing his own observations against those of other students, concluded (MS., p. 127): "There seem to be fairly definite indications that a distinct form of carbon-paint pottery, decorated in what I have referred to as 'McElmo style' occurs with Mancos black-on-white as well as with Mesa Verde black-on-white . . . and that it may appear late in the occupation of Mancos sites." Nevertheless, Reed failed to convince himself of the reality of a

McElmo black-on-white bridge between the mineral-paint Mancos variety and the carbon-paint Mesa Verde. The transition between these two latter "evidently was a rapid but irregular process" (*ibid.*, p. 118).

Deric O'Bryan also has made a thorough analysis of the Mancos and McElmo phases and balanced one against the other. He recognizes distinctive qualities in each, the first culturally P. II and dated about 900 to 1050; the second, P. III and about 1050 to 1150 (O'Bryan, 1950). Each phase has its own peculiar pottery, differing not only in character of the pigment used, but also in surface treatment and choice of design elements. Chaco Canyon influences were particularly evident on Mancos Phase pottery according to O'Bryan (*ibid.*, p. 108); McElmo black-on-white, although often present on Mancos sites, was more akin to Mesa Verde black-on-white. Mancos sites are legion north of the Rio San Juan but O'Bryan knows of no pure McElmo site (*ibid.*, p. 109).

This Mancos-McElmo association is not accepted by all workers in the field. Lancaster and Pinkley (1954) question O'Bryan's Mesa Verde dating and his postulated McElmo phase because at Site 16, in a P. II cultural level with a terminal date near A. D. 1100, some 44 percent of the pottery was Mancos black-on-white, yet no sherd either of Mesa Verde or Corrugated-coil was present. Reed (1944, p. 51) also doubts the reality of the McElmo; sees no need for an intermediate ware between Mancos and true Mesa Verde. That there was a merging along the Mancos-McElmo line is perhaps substantiated by Miss Shepard (1939, p. 254), who points out that the mineral paint of P. II potters throughout La Plata Valley was being gradually replaced in Early P. III and then, quickly, was entirely superseded by reintroduction of organic paint.

I have cited these several authors because it is my belief that many of our Pueblo del Arroyo black-on-white vessels are really "Mancos" and that our abundant Chaco-San Juan type is essentially "McElmo"; hence the "Chaco-like" quality various investigators have seen in pottery north of the Rio San Juan. The producers of Mancos ware are the older, but if they drifted south and arrived in Chaco Canyon first, they were soon followed by the McElmo strain. Migration or exchange of ideas was southward, in my opinion, rather than the reverse.

These thoughts find support in the recorded observations of other students. In the Pagosa-Piedra region in 1922 Jeancon and Roberts (1924, p. 214) first noted marked similarities to Chaco ceramics and architecture. Roberts (1930, p. 18; 1932, pp. 12-13) later emphasized



PLATE 54.—Bowl from the Houck district, east-central Arizona.
Upper: exterior; lower: interior.
 (Kodachrome by Willard R. Culver.)



PLATE 55. Three redware vases from Room 15.
(Kodachrome by Willard R. Culver.)

this fact and suggested a migration from southwestern Colorado to Chaco Canyon in "fairly early times." Miss Dutton (1938, p. 94) echoes this possibility in concluding her monograph on Leyit Kin, a small-house ruin in Chaco Canyon.

It was a combination of Chaco features at Lowry Ruin that prompted Martin's work there (Martin, 1936, p. 22). Reed (1944, p. 49), adopting Mera's type designations, regarded Chaco 2 and Chaco 3 sherds from Site 1, Mancos Canyon, as twelfth-century intrusives. O'Bryan (1950, p. 108) recognized a "predominantly Chaco influence" upon the culture of Mancos Mesa between A. D. 900 and 1050. Morris (1939) repeatedly mentions Chaco-like and pure Chaco pottery in La Plata Valley and accepts both varieties as contemporaneous with "non-Chaco" (*ibid.*, p. 205).

Morris (*ibid.*, p. 53) observed that sherds from Building I, Site 39, "clearly belong to the Chaco complex" but conform more closely to sherds from the lower level of the West Pueblo at Aztec than to those from the great houses of Chaco Canyon. Morris quotes Kidder (1924, p. 56) to the effect that "Aztec ruin is architecturally a perfect example of a Chaco pueblo" and then points out that the "pottery made and used by the builders of the Aztec ruin is more Chacoese than Chaco. . . . It is representative of the black-on-white ensemble that was in general use north of the river at the time when the best wares of the Chaco center were being made, and I believe is the result of local expression of the generalized Chaco urge far more than of direct influence from the Chaco itself" (Morris, 1939, p. 205). In form and decoration many of the vessels Morris (1915, 1919) exhumed at Aztec are indistinguishable from those we collected at Pueblo del Arroyo.

This is equally true of Chaco-like pottery from Lowry Ruin and elsewhere. Martin's descriptive text and illustrations of Mancos and McElmo black-on-white vessels (Martin, 1936, 1938; Martin and Willis, 1940) are equally applicable to specimens herein reported under our several designations. Martin's data do not always distinguish clearly between Mancos and McElmo and I am not sure they can. Some of his illustrations, by the definition, look more McElmo than Mancos and vice versa.

The ancestry of the brilliant Chaco Canyon culture has intrigued every archeologist who has studied it. Kidder directed attention to the wide distribution of Chaco-like pottery beyond the San Juan—pottery that "may indicate a northwestern spread or a northwestern origin of the Chaco culture" (Kidder, 1924, p. 56). Morris (1939, p. 204) seems in complete agreement.

Morris seems to answer all those who see a northward spread of Chaco Canyon culture and, at the same time, to summarize his own thoughts on the subject when he wrote (*ibid.*, p. 204): "The Chaco-like remains north of the San Juan, both architectural and ceramic, are so widespread and so numerous that I consider it untenable to view them wholly as an extension of or a backwash from, the Chaco Canyon center. . . . The most Chaco-like of the vessels from the north country, which seem so significant when viewed singly or selectively grouped, become far less so when viewed as the minor component that they are of the totality of wares among which they occur."

My own field experiences in southwestern Colorado and southeastern Utah are too far removed to be useful in this study, but memory of them finds me in complete accord with Morris and Kidder if not, indeed, a bit more certain than they that the cradle of Chaco culture lies among the P. I and P. II remains north of the Rio San Juan. Nevertheless, I must leave to others the task of bringing together the data that will substantiate or refute this conviction. All elements of design indicated for the mineral-paint Mancos and for the organic-paint McElmo wares will be found on Pueblo del Arroyo vessels illustrated herein.

Florence M. Hawley, perhaps the first after Kidder to essay a detailed description of Chaco Canyon pottery, divided the whole into types and undertook to name each on the basis of its internal and external features. From the east refuse mound at Chetro Kettle she described (1936) "Escavada Black on White," "Gallup Black on White," and "Chaco Black on White." These, together with "Puerco Black on White" and "Red Mesa Black on White"—all sherd-temper, iron-paint varieties—were subsequently reported from Bc 50-51, a small P. II-P. III house on the south side of Chaco Canyon, opposite Pueblo Bonito (Hawley, 1937; Kluckhohn and Reiter, 1939, table 2). Gladwin (1945, p. 118), than whom none has studied southwestern pottery more intensively, doubted that anyone could distinguish between these five types, and I find myself equally helpless. Other published descriptions (Hawley, 1936, 1939; Colton and Hargrave, 1937) reveal no basic type differences that I detect except, perhaps, in paste color, surface finish, and design—features in which no two vessels are precisely alike.

Summarizing her study of pottery from Tseh So (the Bc 50-51 of Kluckhohn and Reiter, 1939), Miss Hawley (1937, p. 86) remarked upon the prevalence of McElmo black-on-white and its evidence of trade from the Mesa Verde country. McElmo black-on-white and our

Chaco-San Juan group are identical as far as I can determine. Both are carbon-paint types and predominantly sherd tempered; both are synonymous with proto-Mesa Verde, the precursor of true Mesa Verde.

The great Chaco villages were at point of eclipse when true Mesa Verde pottery began to appear in Chaco Canyon. Our sherd collections from local small-house sites such as Tseh So indicated that some were earlier, some later, than the great houses in their heyday. Only a handful of Mesa Verde sherds was recovered at Pueblo del Arroyo where the Chaco-San Juan, or McElmo, was the dominant black-on-white type.

VII. CONCLUSIONS

Despite the reconstruction so evident in the middle section, between its north and south wings, Pueblo del Arroyo appears to have been a relatively short-lived settlement. There is no associated external trash pile now visible, and if the rubbish layer seen in the Hyde Expedition photographs (pl. 53, A-C) marks the position of such a pile, it was a modest accumulation soon buried under 2 to 3 feet of water-borne silt. The recorded bracket of tree-ring dates from Pueblo del Arroyo, A. D. 1052-1117, falls within the last half of a similar bracket from Pueblo Bonito, A. D. 807-1130. Architecture and ceramics further evidence a contemporaneity with Pueblo Bonito and prove that the inhabitants of Pueblo del Arroyo were more in tune with the Late Bonitians than with their P. II neighbors, the Old Bonitians. It is not beyond reason that Pueblo del Arroyo was built by a group migrant from the larger village, less than 300 yards distant.

The builders of Pueblo del Arroyo, trained to the Chaco tradition, were not long in sole possession, if I read the signs correctly. They moved on, or part of them did, and the bearers of a slightly different culture came in to take their place. It is barely possible that the outward movement was spurred by annual floodwaters and the mud they carried—recurrent deposits welcomed on farmland but not satisfactorily diverted from the pueblo by a 2-foot-high, east-west masonry wall. The twelfth-century arroyo south of the old wall carved its 16-foot-deep channel somewhat later.

Partial abandonment of the original village and resettlement by an alien people are indicated by changes in the pottery complex and in architecture. A cruder, non-Chaco type of masonry was introduced in the construction of Rooms 1-7 and elsewhere. Kiva B, associated with Rooms 1-7, was equipped with an above-floor ventilator, a northern trait. The seven kivas we cleared within the pueblo proper were all built with Chaco-type subfloor ventilating systems, but in four cases, Kivas F, G, I, and J, alterations followed and above-floor ventilators were substituted. Wall repairs and new walls in this area exhibit stonework of inferior quality. Unused rooms and kivas became dumps for household rubbish and in this a dozen or more burials were made, all but three of which had subsequently been distributed and widely scattered. Although an established custom in contemporary P. III

communities to the northward, intramural burial was not a recognized practice of the high Chaco culture.

West of Pueblo del Arroyo, on a silt stratum 6 inches above the base of its west-wall masonry, are the remains of a triple-walled tower over 73 feet in diameter. This is a type of structure well known along McElmo Creek, in southwestern Colorado, but we never expected to find one in Chaco Canyon. Our McElmo Tower had been outlined and its walls begun; then the unfinished stonework was pulled down and the rocks salvaged for use elsewhere. Potsherds recovered from this wreckage were preponderantly of a variety we called the Chaco-San Juan—an organic-paint variety in marked contrast to the several mineral-paint types native to Chaco Canyon.

As a new pottery type the Chaco-San Juan made its appearance at nearby Pueblo Bonito comparatively late, after the village had attained its majority in growth and prestige. Pueblo Bonito's famed hachured ware was in every household before Chaco-San Juan fragments began to accumulate in local trash piles, and this seems equally true of Pueblo del Arroyo.

In my opinion most of our Chaco-San Juan pottery is identical with what others have called "proto-Mesa Verde" or "McElmo." Both in Chaco Canyon and beyond the Rio San Juan the McElmo (or proto-Mesa Verde) is frequently found in association with another type, the sherd-tempered, mineral-painted "Mancos." Together, Mancos and McElmo account for much of the "Chaco-like" quality archeologists see in pottery from ruins outside the Chaco area.

Morris, who has unquestionably given more thought to this resemblance than anyone else, was repeatedly reminded of Chaco Canyon, and especially by occasional vessels that appeared to be trade pieces from it, while exploring La Plata Valley. He regarded as contemporaneous the pure Chaco, the Chaco-like, and the non-Chaco pottery he exhumed there (Morris, 1939, p. 205) but warned against confusing the pure Chaco and the Chaco-like.

Recalling his explorations of 20 years before, Morris wrote "the largest great house at Aztec Ruin National Monument is a Chaco structure in every detail, and the pottery made by its builders is distinctly Chaco-like." But, after a period of abandonment, "makers of Mesa Verde pottery took over" (Morris, *ibid.*, p. 39). Again (*ibid.*, p. 205) "pottery made and used by the builders of the Aztec ruin is more Chacoeseque than Chaco." Illustrations in his earlier reports (1915, 1919) show that the Aztec vessels Morris regarded as Chacoeseque or Chaco-like include what we, at Pueblo del Arroyo, would classify as Chaco-San Juan.

Speculating upon the ancestry of the distinctive Chaco and Mesa Verde wares, Morris (1939, p. 204) thought it "altogether possible that both grew out of the same general substratum, and that this substratum was as much indigenous to the country north of the San Juan as it was to any other." This premise has much in its favor. Prudden was perhaps first to point out that certain distinctive qualities in pottery from ruins north of the San Juan seem ancestral either to the Chaco, the Mesa Verde, or both. The ubiquitous Mancos ware, usually described as Pueblo II, is widely distributed throughout the San Juan country and has within it elements that foreshadow both Mesa Verde and Chaco.

The content and the relative ages of the Mesa Verde and Chaco high cultures have been fairly well explored, but there is a deal of digging yet to be done in what Morris calls the substratum from which they emerged. In 1921 and 1922 Jeancon and Roberts discovered and partially excavated a small ruin near the famous Piedra Parada, in Archuleta County, Colorado (Jeancon, 1922; Jeancon and Roberts, 1923-1924). That ruin may not be the only one of its kind thereabout, but I know of no other. Its architecture and ceramics are so indisputably Chaco-like as to warrant belief that the structure housed colonists from Chaco Canyon, a hundred miles or more to the south. With this ruin in mind but referring more specifically to pottery from southeastern Utah and southwestern Colorado, Kidder (1924, p. 56) suggested the possibility of "a northwestern spread or a northwestern origin of the Chaco culture."

In shape, technique, and design many of the Chaco-made vessels from Pueblo del Arroyo are duplicated from P. II levels on Alkali Ridge, southeastern Utah (Brew, 1946), and our organic-paint Chaco-San Juan type is abundantly represented in the U. S. National Museum by P. III sherds from Far View House, Mesa Verde National Park (U.S.N.M. No. 298851), and from Pipe Shrine House (No. 326398). By type alone, pottery from Pueblo del Arroyo unites the Pueblo II culture complex with that of Pueblo III.

After 40 years experience in Southwestern archeology and with the question of origins still unresolved, Morris (1939, p. 202) believed that the "lead-up" to full Chaco ware, at least along the La Plata, came "through an intermediate stage directly from Pueblo II." My own feeling in the matter, based primarily upon our Chaco Canyon collections, is that there was no intermediate stage. At Pueblo Bonito full-blown Chaco ware is Pueblo II plus the hachured types, and Pueblo del Arroyo reflects Pueblo Bonito. Our iron-painted

varieties, Transitional, Degenerate, and Solid, have their counterparts in almost every P. II ruin throughout the San Juan country. I see no halfway point.

The older portion of Pueblo Bonito is a typical Pueblo II settlement—an arc of masonry dwellings with storerooms at the rear, sunken kivas in front, and a communal trash pile beyond. Throughout occupancy Old Bonito did not change its style of architecture, and its pottery, despite successive vogues in ornamentation, continued to be thin and hard with hand-smoothed surfaces, paper-white slips, and night-black designs in iron-oxide paint. Throughout, bowls remained deep with rounded bottoms, thinned rims, and blackened lips; jars remained squat and globular; ladles, of the half-gourd form. Favored elements of design included interlocking whorls, bat-wing figures and stepped triangles, checkerboard, wide-line rectilinear scrolls, and curvilinear designs with squiggled hatching and filled-in corners. The old settlement was a P. II town with no urge for change.

After Old Bonitian rubbish had piled up to a depth of 8 feet, new vessel shapes and new designs suddenly appeared. Rectilinear compositions in boldly bordered, straight-line hachure replaced some of the older patterns. Then came the Chaco-San Juan variety with its velvet-smooth finish and proto-Mesa Verde type of decoration.

The descriptive characteristics of "pure Chaco" given by Morris (1939, p. 205) and by Kidder (1924, p. 52) were formulated after careful study primarily of sherds picked up from the surface at Pueblo Bonito. We have since learned that this village in its prime was inhabited by two peoples, one more laggard culturally than the other. The La Plata sherds Morris illustrates (*ibid.*, pls. 287, 288) as pure Chaco black-on-white might, with a few exceptions, have come directly from the Old Bonitian trash pile under the West Court at Pueblo Bonito. The few exceptions are fragments of Early Hachure, alone or combined with Solid.

Since Old Bonitian pottery is well represented at Pueblo del Arroyo we know that its makers were still active. They did not reside here, but they lived less than a quarter-mile distant. However, the dominant black-on-white pottery at Pueblo del Arroyo was our Chaco-San Juan type, an organic-paint variety that seems identical with McElmo black-on-white, a prominent Early P. III ware north of the Rio San Juan. The predominance of this type, plus remains of the unfinished McElmo Tower, intramural burials, altered Chaco-type kivas, and other factors identify Pueblo del Arroyo as a Chaco village brought under control of migrants from the north after relatively brief oc-

cupancy by its builders. Obviously some of the original settlers continued to reside in the village, for their characteristic pottery continued to accumulate in local rubbish piles and to be intermixed with fragments of pottery introduced by the immigrants.

Abandonment of Pueblo del Arroyo by its builders, or at least part of them, was deliberate and orderly. In general, only a small amount of blown sand had collected on the floors we cleared. Some roofing timbers had been salvaged for reuse; charred ceiling poles and beam fragments were noted here and there and the pilaster logs in Kiva C had been burned, but we found no evidence of a major conflagration. The east wall of Room 24 was reddened by fire above a 33-inch accumulation of blown sand and fallen masonry, and the sandy fill in Room 25 was likewise scorched.

To me the evidence indicates that it was a proto-Mesa Verde group, stepping out boldly from a Mancos-type P. II status north of the San Juan River, that migrated to Chaco Canyon, joined the inhabitants of Pueblo Bonito and occupied partially abandoned Pueblo del Arroyo. True Mesa Verde pottery made its appearance later, just as Pueblo del Arroyo was about to be vacated a second time and shortly before the final exodus began at Pueblo Bonito.

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APPENDIX A

SIZE AND PROVENIENCE OF OBJECTS ILLUSTRATED

PLATES

Plate	Diameter (D) or length x width		Height or thickness		Provenience	Field No.	U.S.N.M. No.
	Inches	Cm.	Inches	Cm.			
22, <i>a</i>	11 (D)	27.9	4½	11.4	14	96	334604
<i>b</i>	12⅞ (D)	32.7	5¼	13.3	Kiva F	573	334612
<i>c</i>	10¾ (D)	27.3	4	10.1	28	192	334622
<i>d</i>	10⅞ (D)	26.9	4¼	10.7	15	129	334596
<i>e</i>	13½ (D)	33.3	6½	16.5	15	612	334613
<i>f</i>	11½ & 13½ (D)	29.2 & 34.2	6⅞	17.4	15	613	334614
<i>g</i>	13½ (D)	34.2	6	15.2	27	144	334594
<i>h</i>	15¼ & 10¾ (D)	40 & 27.3	7¼	18.4	27	142	334593
<i>i</i>	12 (D)	30.4	5	12.7	27	143	334597
23, <i>a</i>	5½ (D)	13.9	2⅝	6.6	28	616	334616
<i>b</i>	5 (D)	12.7	2	5.0	43	287	334607
<i>c</i>	5¾ (D)	14.6	2¼	5.7	32	186	334621
<i>d</i>	12 (D)	30.4	5	12.7	32	614	334615
<i>e</i>	13½ (D)	34.2	6¼	15.8	32	184	334592
<i>f</i>	12½ (D)	31.7	4½	11.4	32	185	334595
<i>g</i>	10 (D)	25.4	4½	11.4	39	396	334598
<i>h</i>	9 (D)	22.8	3½	8.8	39	403	334600
<i>i</i>	10 (D)	25.4	4¼	10.7	39	394	334599
<i>j</i>	9⅞ (D)	25.0	4⅞	12.3	39	397	334609
<i>k</i>	6¾ (D)	17.1	3⅞	7.9	39	404	334611
<i>l</i>	10 (D)	25.4	4⅞	12.2	39	402	334610
24, <i>a</i>	8¾ (D)	22.2	3⅝	9.2	44	428	334606
<i>b</i>	10¾ (D)	27.3	4½	11.4	44	429	334602
<i>c</i>	10½ (D)	26.6	4	10.1	27	164	334603
<i>d</i>	9½ (D)	24.1	2¾	6.9	40	445	334601
<i>e</i>	5¾ (D)	14.6	6½	16.5	40	444	334571
<i>f</i>	3½ (D)	8.8	9⅞	23.1	15	126	334575
<i>g</i>	2⅞ (D)	6.0	1½	3.8	44	423	334639
<i>h</i>	5½ x 3¼	13.0 x 9.5	1¾	4.4	27	123	334636
<i>i</i>	5 (D)	12.7	5¼	13.3	27	168	334647
<i>j</i>	6½ x 5½	16.5 x 13.9	5	12.7	15	147	334578
25	11⅞ (D)	28.8	4⅞	11.1	39, 43, 44, 47	574	334618
26, <i>a</i>	13½ x 2¾	34.2 x 6.9	1½	3.8	27	165	334630
<i>b</i>	13⅞ x 3⅞	35.2 x 8.5	1½	3.8	Kiva C	173	334625
<i>c</i>	17¼ x 3¼	45.0 x 8.2	1	2.5	Kiva C	174	334626
27, <i>a</i>	4¼	10.7	1⅞	4.1	44	424	334628
<i>b</i>	9 x 4½	22.8 x 11.4	1¾	4.4	27	158	334623

(Continued)

PLATES—continued

Plate	Diameter (D) or length x width		Height or thickness		Provenience	Field No.	U.S.N.M. No.
	Inches	Cm.	Inches	Cm.			
27, c	$7\frac{3}{4} \times 3\frac{1}{2}$	19.6 x 8.8	$1\frac{1}{2}$	3.8	44	426	334624
d	$4\frac{1}{4} \times 1\frac{1}{2}$	10.7 x 3.8			44	425	334627
e	$9\frac{1}{2} \times 4\frac{1}{4}$	24.1 x 10.7	$1\frac{3}{4}$	4.4	32	187	334629
f	$6\frac{5}{8} \times 3\frac{1}{8}$	16.8 x 7.9	$1\frac{1}{2}$	3.8	27	163	334631
g	$3\frac{5}{8} \times 2\frac{1}{8}$	9.8 x 5.3	$\frac{3}{4}$	1.9	27	156	334633
h	$3\frac{7}{8} \times 1\frac{7}{8}$	9.8 x 4.7	$\frac{3}{4}$	1.9	27	157	334634
i	$10 \times 4\frac{1}{2}$	25.4 x 11.4	$1\frac{7}{8}$	4.7	39	401	334632
j	$2\frac{1}{2} \times 1\frac{1}{16}$	6.3 x 3.9	$\frac{3}{4}$	1.9	W. of Room 49	606	334635
28, a	$6\frac{3}{4}$ (D)	17.1	$5\frac{1}{4}$	13.3	65	557	334588
b	6 (D)	15.2	$5\frac{1}{2}$	13.9	51	532	334589
c	$8\frac{1}{4}$ (D)	20.9	$5\frac{1}{4}$	13.3	2, 3	95	334587
d	$6\frac{3}{4}$ (D)	17.1	7	17.7	28	624	334565
e	6 (D)	15.2	5	12.7	44	427	334590
f	$4\frac{1}{4}$ (D)	10.1	$5\frac{1}{2}$	13.9	15	128	334573
g	5 (D)	12.7	$7\frac{1}{8}$	18.0	27	145	334568
h	$5\frac{3}{4}$ (D)	14.6	$7\frac{1}{8}$	18.0	44	288	334569
i	6 (D)	15.2	8	20.3	39	400	334570
j	5 (D)	12.7	$6\frac{5}{8}$	16.8	28	629	334574
k	$5\frac{1}{2}$ (D)	13.9	$6\frac{3}{4}$	17.1	39	395	334572
29, a	8 (D)	20.3	$4\frac{3}{4}$	12.0	51	531	334579
b	$3\frac{1}{2}$ (D)	8.8	$1\frac{5}{8}$	4.7	27	122	334586
c	$8\frac{1}{8}$ (D)	20.6	$4\frac{3}{4}$	12.0	46	533	334580
d	$11\frac{3}{4}$ (D)	29.8	$6\frac{1}{2}$	16.5	27	155	334584
e	$11\frac{3}{8}$ (D)	28.8	6	15.2	27	148	334585
f	$8\frac{1}{8}$ (D)	20.6	$5\frac{1}{8}$	13.0	44	633	334582
g	9 (D)	22.8	$5\frac{7}{16}$	13.8	15	634	334583
h	$7\frac{3}{8}$ (D)	18.7	$4\frac{1}{4}$	10.7	15	634	404484
i	$8\frac{3}{8}$ (D)	21.2	$6\frac{5}{16}$	16.0	44	632	334581
30, a	$15\frac{1}{2}$ (D)	39.3	$12\frac{1}{2}$	31.7	15	626	334560
b	$13\frac{3}{4}$ (D)	34.9	$11\frac{1}{2}$	29.2	15	627	334561
c	14 (D)	35.5	14	35.5	27	146	334551
d	$14\frac{1}{4}$ (D)	36.1	$14\frac{3}{4}$	37.4	27	159	334552
e	$12\frac{3}{4}$ (D)	32.3	$12\frac{3}{4}$	32.3	27	160	334554
f	15 (D)	38.1	$13\frac{3}{4}$	34.9	27	161	334555
31, a	$14\frac{3}{4}$ (D)	37.4	$14\frac{1}{4}$	36.1	27	162	334553
b	$13\frac{1}{4}$ (D)	33.6	$11\frac{5}{8}$	29.5	51	620	334558
c	$19\frac{3}{4}$ (D)	50.1	18	45.7	51	621	334559
d	17 (D)	43.1	$18\frac{1}{4}$	46.3	28	618	334556
e	$17\frac{3}{4}$ (D)	45.0	15	38.1	28	619	334557
32, a	$10\frac{1}{2}$ (D)	26.6	$7\frac{1}{2}$	19.0	43, 44	628	334562
b	$9\frac{1}{8}$ (D)	23.1	$8\frac{5}{8}$	21.2	27	623	334564
c	9 (D)	22.8	$6\frac{5}{16}$	16.0	39	636	334567
d	$16\frac{1}{4}$ (D)	41.2	15	38.1	15	127	334646
e	11 (D)	27.9	$13\frac{1}{4}$	33.6	64	637	334648
33, a	9 (D)	22.8	$9\frac{3}{4}$	24.7	65		404485

(Continued)

PLATES—*continued*

Plate	Diameter (D) or length x width		Height or thickness		Provenience	Field No.	U.S.N.M. No.
	Inches	Cm.	Inches	Cm.			
33, <i>b</i>	8 $\frac{7}{8}$ (D)	22.5	11	27.9	65		404490
<i>c</i>	7 $\frac{5}{8}$ (D)	19.3	8 $\frac{7}{8}$	22.5	65		404486
<i>d</i>	12 $\frac{1}{4}$ (D)	31.1	14 $\frac{3}{4}$	37.4	65		404487
<i>e</i>	11 $\frac{1}{4}$ (D)	28.5	13 $\frac{3}{8}$	33.3	65		404489
<i>f</i>	12 $\frac{3}{4}$ (D)	32.3	15	38.1	65		404488
<i>g</i>	15 $\frac{1}{4}$ (D)	38.7	16 $\frac{1}{2}$	41.9	27	172	334643
<i>h</i>	13 $\frac{1}{2}$ (D)	34.2	15	38.1	27	170	334642
<i>i</i>	14 (D)	35.5	16	40.6	27	169	334644
34, <i>a</i>	9 $\frac{3}{4}$ (D)	24.7	10 $\frac{3}{4}$	27.3	65	638	334649
<i>b</i>	14 (D)	35.5	13 $\frac{3}{4}$	34.9	65	639	334650
<i>c</i>	13 $\frac{1}{4}$ (D)	33.6	14 $\frac{1}{4}$	36.1	65	640	334651
<i>d</i>	13 $\frac{1}{2}$ (D)	34.2	15 $\frac{1}{2}$	39.3	65	641	334652
<i>e</i>	13 $\frac{3}{4}$ (D)	34.9	13 $\frac{1}{2}$	34.2	65	642	334653
<i>f</i>	13 $\frac{3}{4}$ (D)	34.9	17	43.1	65	643	334654
<i>g</i>	14 $\frac{1}{4}$ (D)	36.1	16	40.6	65	644	334655
<i>h</i>	13 $\frac{1}{2}$ (D)	34.2	16 $\frac{3}{4}$	42.5	65	645	334656
<i>i</i>	12 $\frac{1}{4}$ (D)	31.1	14 $\frac{1}{4}$	36.1	65	646	334657
<i>j</i>	10 $\frac{1}{2}$ (D)	26.6	13 $\frac{1}{4}$	33.6	65	647	334658
<i>k</i>	12 (D)	30.4	15	38.1	65	648	334659
<i>l</i>	10 $\frac{3}{4}$ (D)	27.3	11	27.9	65	649	334660
35, <i>a, a'</i>	3 x 1 $\frac{1}{2}$	7.6 x 3.8	8 $\frac{1}{8}$	20.6	27	141	334638
<i>b, b'</i>	4 x 1 $\frac{5}{8}$	10.1 x 4.7	9 $\frac{1}{4}$	23.4	27	140	334637
36, A					W. of Room 49	592	334676
B	5 $\frac{1}{8}$ (D)	13.0	2	5.0	51	328	334879
37, <i>a</i>	1 $\frac{5}{8}$ x 1 $\frac{3}{8}$	4.7 x 2.3			47	416	334931
<i>b</i>	2 $\frac{1}{8}$ x 1 $\frac{1}{8}$	5.3 x 2.8			47	415	334931
<i>c</i>	1 $\frac{7}{8}$ x $\frac{7}{8}$	4.7 x 2.2			Kiva G	526	334931
<i>d</i>	1 $\frac{3}{4}$ x 1	4.4 x 2.5			27	124	334934
<i>e</i>	2 $\frac{7}{8}$ x $\frac{3}{4}$	7.3 x 1.9			W. of Room 29	188	334931
<i>f</i>	11 $\frac{5}{16}$ x 1	28.7 x 2.5			41	506	334923
<i>g</i>	5 x $\frac{7}{8}$	12.7 x 2.2			Kiva F	473	334880
<i>h</i>	5 $\frac{1}{8}$ x 1 $\frac{1}{2}$	13.0 x 3.8			Kiva I	494	334885
<i>i</i>	4 x 1 $\frac{1}{8}$	10.1 x 1.7			51	332	334895
<i>j</i>	4 $\frac{9}{16}$ x $\frac{1}{4}$	11.5 x 0.6			Kiva G	525	334884
<i>k</i>	4 $\frac{3}{8}$ x 1 $\frac{1}{2}$	12.0 x 3.8			55	447	334910
<i>l</i>	2 $\frac{1}{16}$ x $\frac{1}{2}$	5.2 x 1.2			Kiva G	525	334884
<i>m</i>	2 $\frac{3}{8}$ x $\frac{3}{4}$	6.0 x 1.9			9	137	334889
<i>n</i>	4 $\frac{1}{2}$ x $\frac{1}{2}$	11.4 x 1.2			Misc.	461	334897
<i>o</i>	4 $\frac{1}{8}$ x $\frac{7}{8}$	10.4 x 2.2			41	505	334883
<i>p</i>	8 $\frac{1}{2}$ x 1 $\frac{5}{16}$	21.5 x 0.7			44 subfl.	357	334924
<i>q</i>	8 $\frac{1}{2}$ x 1 $\frac{1}{4}$	21.5 x 3.1			Kiva F	470	334936
<i>r</i>	1 (D) x 3 $\frac{3}{4}$	2.5 x 9.5			51	334	334948
<i>s</i>	5 $\frac{3}{8}$ x 11 $\frac{5}{16}$	13.6 x 3.0			11	153	334937
38, <i>a</i>	1 $\frac{5}{16}$ — $\frac{1}{2}$ (D)	0.7—1.2			16	83	334692
<i>b</i>	$\frac{5}{8}$ (D) x 10 $\frac{1}{8}$	1.5 x 25.7			9 B-III	17	334693

(Continued)

PLATES—continued

Plate	Diameter (D) or length x width		Height or thickness		Provenience	Field No.	U.S.N.M. No.
	Inches	Cm.	Inches	Cm.			
38, c	$\frac{5}{8}$ (D) x $11\frac{3}{4}$	1.5 x 29.8			9 B-III	17	334693
d	$\frac{7}{8}$ (D) x 20	2.2 x 50.7			16 B	81	334690
e	$20\frac{1}{8}$ x $1\frac{5}{8}$	51 x 4.1	$\frac{3}{4}$	1.9	9	62	334689
f	$4\frac{1}{2}$ x $1\frac{7}{8}$	11.4 x 4.7	$1\frac{9}{16}$	3.9	65	556	334955
g	$7\frac{1}{8}$ x $2\frac{5}{8}$	18.0 x 6.6	$2\frac{1}{8}$	5.3	51	329	334955
h	7 (D)	17.7			44	293	334708
i	$4\frac{1}{8}$ x $1\frac{3}{4}$	10.4 x 4.4	$\frac{1}{4}$	0.6	9 B-II	57	334699
j	$5\frac{1}{2}$ x $1\frac{1}{2}$	13.9 x 3.8	$\frac{1}{4}$	0.6	24	115	334694
k	32 x $2\frac{1}{4}$	81.2 x 5.7	$1\frac{3}{8}$	3.4	16 B	79	334709
39, A	$5'$ $10\frac{3}{4}$ x $8\frac{1}{2}$	179.7 x 21.5	$5\frac{1}{2}$	13.9	16	78	334710
40, a	$\frac{3}{4}$ x $\frac{5}{8}$	1.9 x 1.5			44	299	334799
b	$1\frac{1}{16}$ x $1\frac{11}{16}$	2.6 x 1.7			36	260	334799
c	$\frac{1}{8}$ x $\frac{3}{8}$	2.3 x 0.9			44	379	334799
d	$\frac{1}{8}$ x $\frac{9}{16}$	2.3 x 1.4			40	438	334799
e	$\frac{1}{8}$ x $\frac{1}{2}$	2.3 x 1.2			4	36	334799
f	$\frac{1}{8}$ x $\frac{7}{8}$	2.3 x 2.2			Kiva F	477	334799
g	$1\frac{1}{16}$ x $\frac{1}{2}$	2.6 x 1.2			44	299	334799
h	$1\frac{3}{8}$ x $\frac{9}{16}$	3.4 x 1.4			39	226	334799
i	1 x $\frac{1}{2}$	2.5 x 1.2			E. of Kiva B	49	334799
j	$1\frac{1}{8}$ x $\frac{1}{2}$	2.8 x 1.2			Kiva I	490	334799
k	$1\frac{3}{8}$ x $1\frac{1}{2}$	3.4 x 3.8			15	117	334792
l	$1\frac{3}{8}$ x $2\frac{1}{8}$	3.4 x 5.3			65	571	334792
m	$3\frac{5}{8}$ x $1\frac{7}{8}$	9.2 x 3.3			36	262	334790
n	$3\frac{3}{4}$ x $1\frac{7}{8}$	9.5 x 3.6			28, 32	181	334788
						182	
o	$4\frac{3}{8}$ (D)	11.1	$\frac{1}{16}$	0.7	41	514	334831
p	$3\frac{1}{2}$ x $3\frac{1}{16}$	8.8 x 7.7	$\frac{1}{4}$	0.6	23	121	334834
q	$4\frac{1}{2}$ (D)	11.4	$\frac{1}{4}$	0.6	51	355	334835
r	$3\frac{3}{8}$ x $3\frac{1}{4}$	8.5 x 8.2	$\frac{1}{4}$	0.6	Kiva "b"	603	334836
s	$5\frac{3}{4}$ x $3\frac{3}{4}$	14.6 x 9.5	$1\frac{1}{8}$	4.1	Kiva "c"	600	334874
t	$2\frac{5}{16}$ x 2	5.8 x 5.0	1	2.5	12	1	334815
u	$2\frac{5}{16}$ x $1\frac{7}{8}$	5.8 x 4.7	$\frac{1}{16}$	1.7	Misc.	464	334816
v	$2\frac{5}{8}$ (D)	7.3	$1\frac{5}{8}$	4.1	Kiva B	93	334859
w	$3\frac{1}{4}$ (D)	8.2	$2\frac{3}{4}$	6.9	23	106	334688
41, a	$5\frac{1}{8}$ x $2\frac{5}{8}$	13.0 x 6.6	$1\frac{3}{4}$	4.4	63	553	334866
b	$6\frac{1}{8}$ x $3\frac{3}{8}$	15.5 x 8.5	2	5.0	23	105	334867
c	$7\frac{1}{2}$ x $3\frac{3}{8}$	19.0 x 8.5	$2\frac{3}{4}$	6.9	2	44	334863
d	6 x $3\frac{3}{8}$	15.2 x 8.5	2	5.0	41	518	334865
e	5 x $3\frac{3}{8}$	12.7 x 7.9	$1\frac{1}{4}$	3.1	51	352	334869
f	4 x $2\frac{1}{4}$	10.1 x 5.7	$1\frac{1}{8}$	2.8	Kiva I	489	334864
g	3 x 2	7.6 x 5.0	$1\frac{5}{8}$	4.1	W. of Room 49	591	334870
h	$4\frac{1}{4}$ x $2\frac{1}{4}$	10.7 x 5.7	$2\frac{1}{4}$	5.7	Kiva I	488	334868
i	$6\frac{1}{2}$ x 5	16.5 x 12.7	$1\frac{1}{8}$	2.8	Misc.	217	334821
j	7 x 6	17.7 x 15.2	2	5.0	Kiva D, Bonito	223	335921
k	$13\frac{5}{8}$ x $6\frac{3}{4}$	34.6 x 17.1	$1\frac{1}{2}$	3.8	27	119	334822

(Continued)

PLATES—concluded

Plate	Diameter (D) or length x width		Height or thickness		Provenience	Field No.	U.S.N.M. No.
	Inches	Cm.	Inches	Cm.			
42, <i>a</i>	$12\frac{3}{8} \times 6$	30.7×15.2	$\frac{1}{2}$	1.2	65	559	334853
<i>b</i>	$15\frac{1}{4} \times 7\frac{1}{4}$	40.0×18.4	1	2.5	65	560	334855
<i>c</i>	$13 \times 7\frac{1}{2}$	33.0×19.0	$\frac{5}{8}$	1.5	43	248	334854
<i>d</i>	$14\frac{3}{8} \times 9\frac{1}{2}$	37.4×24.1	$\frac{3}{8}$	0.9	23	103	334842
<i>e</i>	16×8	40.6×20.3	$\frac{1}{4}$	0.6	23	110	334844
<i>f</i>	$14\frac{1}{8} \times 8\frac{3}{4}$	37.7×22.2	$\frac{3}{8}$	0.9	23	102	334841
<i>g</i>	$14\frac{3}{8} \times 9\frac{1}{2}$	37.4×24.1	$\frac{3}{8}$	0.9	23	104	334843
<i>h</i>	$14\frac{1}{2} \times 7\frac{3}{4}$	36.8×19.6	$\frac{5}{16}$	0.7	23	101	334846
<i>i</i>	$12\frac{1}{8}$ (D)	30.7	$\frac{7}{8}$	2.2	23	108	334848
<i>j</i>	$12\frac{1}{2} \times 7$	31.7×17.7	$\frac{5}{8}$	1.5	27	125	334847
47, <i>a</i>	$8\frac{1}{2}$ (D)	21.5	$3\frac{1}{2}$	8.8	5	166	334605
<i>b</i>	$8\frac{1}{2}$ (D)	21.5	$3\frac{1}{2}$	8.8	5	167	334620
<i>c</i>	$11\frac{1}{2}$ (D)	29.2	$13\frac{1}{4}$	33.6	3	100	334641
<i>d</i>	$10\frac{1}{4}$ (D)	26.0	11	27.9	3	97	334645
54	11 (D)	27.9	$4\frac{3}{4}$	12.0	43	286	334608
55, <i>a</i>	$3\frac{1}{2}$ —6 (D)	8.2—15.2	$9\frac{1}{2}$	24.1	15	630	334576
<i>b</i>	3 — $6\frac{5}{8}$ (D)	7.6—16.8	$10\frac{1}{4}$	26.0	15	630	334576a
<i>c</i>	$3\frac{1}{2}$ — $6\frac{1}{4}$ (D)	8.8—15.8	10	25.4	15	631	334577

TEXT FIGURES

Figure	Diameter (D) or length x width		Height or thickness		Provenience	Field No.	U.S.N.M. No.
	Inches	Cm.	Inches	Cm.			
3	$4 \times 3\frac{1}{4}$	10.1×8.2			8 B-I	3	334713
8	$2\frac{3}{4} \times 2\frac{5}{8}$	6.9×6.6	$\frac{1}{4}$	0.6	41	516	334745
23	$4 \times 1\frac{1}{2}$	10.1×3.8	$\frac{3}{4}$	1.9	W. of Room 49	595	334677
24	$3\frac{1}{4} \times 2\frac{1}{16}$	8.2×6.1			39	403	334600a
25	$4\frac{1}{2} \times 2\frac{1}{2}$	11.4×6.3			Misc.		334680a
26	$\frac{3}{4}$ (D)	1.9	$\frac{3}{4}$	1.9	51	345	334680
27	$1\frac{1}{16}$ (D) x $8\frac{1}{16}$	1.7×22			55	452	334707
28	$5\frac{1}{8} \times 1\frac{5}{8}$	13×4.1	$\frac{1}{4}$	0.6	46	316	334700
29	$4\frac{5}{8} \times 2$	11.7×5			64	579	334697
30	$8\frac{1}{4} \times 3\frac{1}{2}$	20.9×8.8	$1\frac{5}{16}$	0.7	26	132	334829
31, <i>a</i>	$3\frac{1}{2} \times 1\frac{7}{16}$	8.8×1.1	$\frac{1}{8}$	0.3	26	130	334811
<i>b</i>	$2\frac{9}{16} \times \frac{3}{8}$	6.5×0.9	$3\frac{3}{4}$	0.2	26	130	334811
32	$1\frac{1}{8} \times 1\frac{1}{4}$	4.1×4.4			25	134	334789
33	$1\frac{3}{8} \times \frac{5}{8}$	3.4×1.5			55	451	334797
34	$6\frac{3}{8} \times 2\frac{1}{16}$	16.8×7.4	$\frac{1}{2}$	1.2	63	552	334817
35	$3\frac{1}{4} \times 3\frac{3}{8}$	8.2×8.5	3	7.6	64	575	334876
36	$7\frac{1}{8} \times 2\frac{5}{8}$	18×6.6	$2\frac{1}{8}$	5.3	51	329	334955
37, <i>a</i>	$2 \times 1\frac{1}{8}$	5×2.8	$1\frac{7}{16}$	1.1	9 B-II	55	334683
<i>b</i>	$1\frac{1}{16} \times 1\frac{1}{8}$	3.9×2	$\frac{1}{2}$	1.2	62	539	334684
<i>c</i>	$3\frac{1}{4} \times 1\frac{1}{4}$	8.2×4.4	$\frac{3}{4}$	1.9	Kiva "b"	602	334685
<i>d</i>	$1\frac{7}{8} \times \frac{7}{8}$	4.7×2.2	$\frac{3}{8}$	0.9	Kiva I	492	334802
38	$2\frac{5}{8} \times 2\frac{3}{4}$	7.3×6.9	$1\frac{1}{2}$	3.8	55	454	334873
44	$\frac{3}{4}$ (D) x $1\frac{5}{8}$	1.9×4.1			Kiva "a"	604	334686

APPENDIX B

TABLE OF ROOM DIMENSIONS, PUEBLO DEL ARROYO

By HENRY B. ROBERTS

(*e* = estimated.)

Room No.	North	East	South	West	Ceiling height
1	8' 9"	5' 11"	8' 4"	6' 6"	6' 0"
B	9' 0"	6' 2"	8' 7"	5' 7"	5' 0" <i>e</i>
2	7' 11"	6' 2"	8' 8"	5' 9"	4' 11"
B	8' 1"	6' 2"	8' 11"	5' 9"	5' 0" <i>e</i>
3	8' 5"	6' 2"	8' 2"	5' 10"	4' 10"
4	8' 10"	6' 0"	9' 0"	5' 11"	5' 1"
5	8' 2"	7' 7"	8' 6"	7' 4"	5' 0" <i>e</i>
6	8' 5"	5' 9"	8' 3"	6' 2"	5' 0" <i>e</i>
7	8' 2"	10' 6"	8' 7"	10' 0"	6' 2"
8 ¹	15' 3"	5' 10"	15' 2"	5' 7"	8' 4"
B-I	9' 3"	6' 6"	9' 7"	6' 4"	8' 0" <i>e</i>
B-II	6' 2"	6' 4"	5' 10"	6' 4"	8' 0" <i>e</i>
C	15' 6" <i>e</i>	6' 0" <i>e</i>	15' 5"	5' 8"	7' 0" <i>e</i>
9	58' 3"	5' 10"	58' 4"	6' 0"	7' 8"
B-I	15' 4"	6' 7"	15' 3"	6' 11"	8' 4"
C-I	15' 4" <i>e</i>	7' 0" <i>e</i>	15' 3" <i>e</i>	7' 4" <i>e</i>	8' 0" <i>e</i>
B-II	16' 7"	6' 11"	17' 0"	7' 0"	8' 3" <i>e</i>
C-II	16' 7" <i>e</i>	7' 6" <i>e</i>	17' 0" <i>e</i>	7' 8" <i>e</i>	8' 0" <i>e</i>
B-III	15' 8"	7' 0"	15' 0"	6' 8"	8' 3"
C-III	15' 8" <i>e</i>	7' 6" <i>e</i>	15' 0" <i>e</i>	7' 2" <i>e</i>	8' 0" <i>e</i>
10	15' 9"	5' 9"	15' 8"	5' 9"	7' 0"
B	16' 4"	6' 1"	16' 4"	6' 7"	8' 5"
C	16' 6" <i>e</i>	6' 9" <i>e</i>	16' 6" <i>e</i>	7' 3" <i>e</i>	8' 0" <i>e</i>
11 A	34' 0" <i>e</i>	6' 0" <i>e</i>	34' 0" <i>e</i>	5' 9"	7' 0" <i>e</i>
B	19' 8"	6' 4"	19' 8"	6' 5"	8' 4"
C	19' 8" <i>e</i>	6' 10" <i>e</i>	19' 8" <i>e</i>	6' 11" <i>e</i>	8' 0" <i>e</i>
12	15' 6"	9' 2"	15' 5"	9' 0"	6' 10"
B	15' 7"	9' 4"	15' 6"	8' 11"	8' 0"
C	15' 7" <i>e</i>	9' 4"	15' 8"	8' 11" <i>e</i>	8' 0" <i>e</i>

¹ A wall supported by a first-story ceiling beam divided the second story of Room 8 into 8B-I and 8B-II; this partition apparently did not extend into the third story.

Similarly, the second story of Room 9 was separated into three chambers by walls resting each upon paired logs, but in these instances the logs were set above the second-story floor level and the partitions continued into the upper rooms. Originally, Room 9 was approximately 110 feet long, but after its south wall settled outward, extramural buttresses (later joined to form Rooms 1-7) were erected, and inner partitions resulted in Rooms 10 and 11. The second- and third-story partitions of these two rooms rested upon paired beams placed just above the second-story floor and slightly to one side of their ground-floor counterparts. "Ceiling height" is floor to secondary poles above main beams. Letters B, C, and D indicate second, third, and fourth stories.

(Continued)

TABLE OF ROOM DIMENSIONS, PUEBLO DEL ARROYO

—continued

Room No.	North	East	South	West	Ceiling height
13	15' 7"	9' 4"	15' 6"	9' 3"	6' 9"
B	15' 7"	9' 3"	15' 6"	8' 11"	8' 0"
C	15' 7" <i>e</i>	9' 5"	15' 6"	9' 0"	8' 0" <i>e</i>
14	15' 6"	9' 1"	15' 8"	8' 11"	7' 3"
B	15' 6"	9' 1"	15' 11"	9' 1"	8' 3"
C	15' 9" <i>e</i>	9' 1" <i>e</i>	16' 2" <i>e</i>	9' 2" <i>e</i>	8' 0" <i>e</i>
15	15' 3"	8' 9"	15' 4"	9' 2"	7' 4"
B	15' 5"	9' 1"	15' 7"	9' 2"	8' 6"
C	15' 9" <i>e</i>	9' 1" <i>e</i>	15' 11" <i>e</i>	9' 2" <i>e</i>	8' 0" <i>e</i>
16	15' 2"	8' 11"	15' 1"	8' 10"	7' 6"
B	15' 6"	9' 6"	15' 5"	9' 7"	8' 0"
C	15' 6" <i>e</i>	10' 0"	15' 5" <i>e</i>	10' 1" <i>e</i>	8' 0" <i>e</i>
17 ²	6' 3" <i>e</i>	16' 0" <i>e</i>	6' 3" <i>e</i>	15' 10" <i>e</i>	7' 0" <i>e</i>
B	6' 9" <i>e</i>	16' 0" <i>e</i>	6' 9" <i>e</i>	15' 11" <i>e</i>	8' 0" <i>e</i>
C	7' 3" <i>e</i>	16' 2" <i>e</i>	7' 3" <i>e</i>	16' 0" <i>e</i>	8' 0" <i>e</i>
D	7' 6" <i>e</i>	16' 4" <i>e</i>	7' 6" <i>e</i>	16' 2" <i>e</i>	7' 0" <i>e</i>
18	9' 0" <i>e</i>	15' 10" <i>e</i>	9' 0" <i>e</i>	15' 9" <i>e</i>	7' 0" <i>e</i>
B	9' 6" <i>e</i>	15' 10" <i>e</i>	9' 6" <i>e</i>	15' 9"	8' 0" <i>e</i>
C	9' 10" <i>e</i>	16' 0" <i>e</i>	9' 10" <i>e</i>	15' 11" <i>e</i>	8' 0" <i>e</i>
D	10' 0" <i>e</i>	16' 2" <i>e</i>	10' 0" <i>e</i>	16' 1" <i>e</i>	7' 0" <i>e</i>
19	19' 0" <i>e</i>	9' 2" <i>e</i>	18' 6" <i>e</i>	9' 0" <i>e</i>	7' 0" <i>e</i>
B	19' 7" <i>e</i>	9' 2" <i>e</i>	19' 8" <i>e</i>	9' 1" <i>e</i>	8' 0" <i>e</i>
C	19' 9"	8' 11"	19' 10"	9' 0"	8' 0"
D	19' 10" <i>e</i>	9' 0" <i>e</i>	19' 10" <i>e</i>	9' 0" <i>e</i>	7' 0" <i>e</i>
20	15' 2"	8' 11"	15' 8"	9' 3"	6' 10"
B	15' 6"	9' 3"	15' 5"	9' 2"	8' 2"
C	15' 6" <i>e</i>	9' 6" <i>e</i>	15' 5" <i>e</i>	9' 5" <i>e</i>	8' 0" <i>e</i>
21	15' 6"	9' 0"	15' 6"	8' 7"	6' 10"
B	15' 6"	9' 0"	15' 6"	9' 0"	8' 0"
C	15' 6" <i>e</i>	9' 0" <i>e</i>	15' 6" <i>e</i>	9' 0" <i>e</i>	8' 6" <i>e</i>
22	16' 9" <i>e</i>	8' 6" <i>e</i>	16' 6" <i>e</i>	8' 3" <i>e</i>	7' 0" <i>e</i>
B	16' 9"	8' 6"	16' 6"	8' 3"	8' 0" <i>e</i>
C	16' 9" <i>e</i>	8' 10" <i>e</i>	16' 6" <i>e</i>	8' 7" <i>e</i>	8' 0" <i>e</i>
23	15' 4"	9' 4"	15' 3"	9' 3"	7' 3"
B	15' 7"	8' 11"	15' 5"	8' 11"	8' 9"
C	15' 5" <i>e</i>	9' 3" <i>e</i>	15' 5" <i>e</i>	9' 0" <i>e</i>	8' 0" <i>e</i>
24	15' 4"	8' 8"	15' 0"	8' 10"	7' 3"
B	15' 8"	8' 8"	15' 4"	8' 10"	8' 0"
C	15' 8" <i>e</i>	9' 0" <i>e</i>	15' 4" <i>e</i>	9' 2" <i>e</i>	8' 0" <i>e</i>
25	8' 10"	15' 7"	8' 11"	15' 5"	7' 0"
B	10' 0"	15' 7"	10' 1"	15' 5"	8' 0" <i>e</i>

² Rooms 17, 18, 19, 22, 33 to 53 in the western tier, and those elsewhere indicated by dotted lines (fig. 2) remain unexcavated. Fourth-story masonry is still to be seen in the unnumbered rooms south of 17-19 and in the four rooms north of 17-18. The quantity of fallen stonework removed suggests fourth stories also for Rooms 26, 27, and 30; low fourth-story apartments are seemingly represented in the three south rooms of the easternmost tier in the north wing.

(Continued)

TABLE OF ROOM DIMENSIONS, PUEBLO DEL ARROYO
—continued

Room No.	North	East	South	West	Ceiling height
25 C	10' 4" <i>e</i>	15' 8" <i>e</i>	10' 5" <i>e</i>	15' 7" <i>e</i>	8' 0" <i>e</i>
26	8' 11"	15' 8"	9' 1"	15' 9"	7' 2"
B	9' 1"	15' 10"	9' 5"	16' 0"	8' 0"
C	9' 3" <i>e</i>	16' 1" <i>e</i>	9' 3" <i>e</i>	16' 2" <i>e</i>	8' 0" <i>e</i>
D	9' 3" <i>e</i>	16' 2" <i>e</i>	9' 3" <i>e</i>	16' 4" <i>e</i>	7' 0" <i>e</i>
27	10' 8"	15' 11"	10' 4"	15' 10"	6' 10"
B	10' 6"	15' 11"	10' 4"	16' 0"	8' 0" <i>e</i>
C	10' 10" <i>e</i>	15' 11" <i>e</i>	10' 10" <i>e</i>	16' 0" <i>e</i>	8' 0" <i>e</i>
D	11' 2" <i>e</i>	15' 11" <i>e</i>	11' 2" <i>e</i>	16' 0" <i>e</i>	7' 0" <i>e</i>
28	15' 3"	16' 7"	15' 2"	16' 4"	6' 11"
B	15' 8"	16' 7"	15' 4"	16' 6"	8' 0"
C	15' 9" <i>e</i>	16' 7" <i>e</i>	15' 6" <i>e</i>	16' 6" <i>e</i>	8' 0" <i>e</i>
29	9' 3"	15' 1"	8' 9"	15' 0"	7' 0"
B	9' 10"	15' 11"	9' 4"	15' 0"	8' 0" <i>e</i>
C	10' 2" <i>e</i>	15' 11" <i>e</i>	9' 8" <i>e</i>	15' 0" <i>e</i>	8' 0" <i>e</i>
30	8' 0"	15' 5"	8' 11"	15' 1"	7' 0"
B	9' 0"	15' 6"	9' 2"	15' 2"	8' 10"
C	9' 4" <i>e</i>	15' 9" <i>e</i>	9' 6" <i>e</i>	15' 6" <i>e</i>	8' 0" <i>e</i>
D	9' 6" <i>e</i>	15' 11" <i>e</i>	9' 8" <i>e</i>	15' 8" <i>e</i>	7' 0" <i>e</i>
31	10' 10"	15' 9"	10' 6"	15' 6"	6' 8"
B	10' 10"	15' 9"	10' 10"	15' 6"	8' 0"
C	10' 10" <i>e</i>	16' 0" <i>e</i>	10' 10" <i>e</i>	15' 9" <i>e</i>	8' 0" <i>e</i>
32	15' 3"	16' 4"	15' 6"	15' 7"	6' 7"
B	15' 7"	16' 4"	15' 9"	15' 7"	8' 0"
33	9' 0" <i>e</i>	11' 6" <i>e</i>	8' 9" <i>e</i>	11' 3" <i>e</i>	7' 0" <i>e</i>
B	9' 0"	11' 6"	8' 9"	11' 3"	8' 0" <i>e</i>
C	9' 6" <i>e</i>	11' 8" <i>e</i>	9' 3" <i>e</i>	11' 5" <i>e</i>	8' 0" <i>e</i>
34	12' 5"	9' 4"	12' 4"	11' 0"	8' 2"
B	12' 9"	9' 4"	12' 8"	11' 3"	8' 7"
C	12' 9" <i>e</i>	9' 10" <i>e</i>	12' 8" <i>e</i>	11' 9" <i>e</i>	8' 0" <i>e</i>
35	12' 8"	8' 1"	12' 7"	9' 4"	8' 0"
B	12' 8"	8' 0"	12' 7"	9' 7"	8' 7"
C	12' 8" <i>e</i>	8' 0" <i>e</i>	12' 7" <i>e</i>	9' 6"	8' 0" <i>e</i>
36	18' 3"	8' 4"	18' 4"	8' 10"	8' 6"
B	18' 3"	9' 4"	18' 4"	9' 1"	8' 7" <i>e</i>
37	21' 4"	8' 8"	21' 0"	8' 5"	7' 5"
B	21' 9"	9' 0"	21' 2"	9' 0"	8' 7" <i>e</i>
38	8' 11"	10' 0" <i>e</i>	8' 9" <i>e</i>	10' 9" <i>e</i>	7' 0" <i>e</i>
B	9' 2" <i>e</i>	10' 0" <i>e</i>	9' 1" <i>e</i>	10' 9" <i>e</i>	8' 0" <i>e</i>
C	9' 6" <i>e</i>	10' 2" <i>e</i>	9' 5" <i>e</i>	10' 10" <i>e</i>	8' 0" <i>e</i>
39	12' 5"	16' 2"	12' 5"	16' 2"	8' 9"
B	12' 8"	16' 2"	12' 7"	16' 2"	8' 0" <i>e</i>
40	18' 1"	12' 7"	18' 0"	14' 6"	8' 0"
B	18' 0"	12' 8"	18' 3"	14' 8"	8' 7" <i>e</i>
41	21' 8"	12' 6"	21' 5"	12' 1"	6' 3"

(Continued)

TABLE OF ROOM DIMENSIONS, PUEBLO DEL ARROYO
—continued

Room No.	North	East	South	West	Ceiling height
41 B	21' 8"	13' 0"	22' 0"	13' 3"	8' 7" e
42	8' 7" e	13' 2" e	9' 1" e	13' 2"	7' 0" e
B	9' 3"	13' 2"	9' 5"	13' 2"	8' 0" e
C	9' 8" e	13' 4" e	9' 10" e	13' 2" e	8' 0" e
43	12' 2"	15' 10"	12' 4"	15' 10"	8' 8"
B	12' 6"	16' 2"	12' 8"	15' 7"	8' 0" e
44	12' 6"	16' 0"	12' 6"	16' 0"	5' 10"
B	13' 0"	15' 10"	13' 0"	15' 10"	7' 0" e
45	8' 6" e	12' 6" e	8' 8" e	12' 8" e	7' 0" e
B	9' 3"	12' 6"	9' 3"	12' 8"	8' 0" e
C	9' 9" e	12' 7" e	9' 9" e	12' 9" e	8' 0" e
46	12' 2"	6' 5"	11' 9"	7' 8"	3' 8"
B	13' 0"	7' 2"	12' 8"	8' 5"	8' 0" e
47 B ³	12' 11"	8' 3"	13' 0"	7' 4"	7' 0" e
48	8' 6" e	10' 0" e	8' 6" e	10' 0"	8' 0" e
B	8' 10"	10' 0"	8' 10"	10' 0"	8' 0" e
C	9' 2" e	10' 2" e	9' 2" e	10' 0" e	8' 0" e
49	8' 9" e	16' 7" e	9' 0" e	16' 4" e	7' 0" e
B	9' 2" e	16' 7"	9' 5"	16' 6"	8' 0" e
C	9' 6" e	16' 9" e	9' 9" e	16' 6" e	8' 0" e
50	9' 0" e	11' 8" e	9' 0" e	11' 8" e	7' 0" e
B	9' 4" e	11' 8" e	9' 4" e	11' 8" e	8' 0" e
C	9' 10" e	11' 10" e	9' 10" e	11' 10" e	8' 0" e
51	12' 2"	15' 10"	12' 4"	16' 1"	9' 0"
B	12' 4"	16' 1"	12' 7"	15' 11"	8' 0" e
52 B ⁴	13' 4"	10' 1"	13' 1"	10' 2"	6' 0" e
53	9' 0" e	23' 0" e	9' 0" e	23' 9"	7' 0" e
B	9' 6" e	23' 4" e	9' 6" e	23' 11"	8' 0" e
C	9' 10" e	23' 4" e	9' 10" e	23' 11" e	8' 0" e
54	12' 4"	16' 3"	12' 4"	16' 2"	8' 9"
B	12' 4" e	16' 6" e	12' 6" e	16' 5" e	7' 0" e
55	13' 2"	25' 9"	12' 5"	26' 9"	7' 2"
B	13' 4" e	26' 0" e	12' 7" e	26' 10" e	8' 0" e
56	3' 0"	3' 6"	2' 0"	3' 4"	3' 4"
57	3' 4"	3' 11"	3' 9"	3' 11"	
58	8' 7"	4' 7"	8' 7"	4' 5"	
59	9' 0"		8' 5" SE	3' 2"	6' 0" e
				8' 0" SW	
60	3' 9"	6' 0"	3' 7"	6' 2"	
61	3' 7"	5' 9"	3' 9"	5' 7"	
62	17' 9"	4' 2"	17' 9"	3' 4"	7' 7"
63	6' 10"	31' 1"	7' 5"	31' 11"	7' 0" e
64	7' 4"	9' 2"	7' 6"	9' 1"	7' 0" e
65	7' 8"	8' 11"	7' 7"	9' 3"	7' 0" e

³ Room 47B, at the second-story level, overlies the partly razed walls of a kiva.⁴ Like 47B, Room 52B is a second-story chamber above its debris-filled first story.

(Continued)

TABLE OF ROOM DIMENSIONS, PUEBLO DEL ARROYO
—concluded

CEREMONIAL ROOMS

Kiva	Diameter at floor	Width of bench	Height of bench	Number of pilasters	Ceiling height
B	11' 6"	1' 0"	2' 10"	0	7' 9"
C	25' 10"	2' 5"	1' 10"	8	10' 0"
D			(Unexcavated)		
E	14' 6"	1' 8"	2' 0"	6	7' 0"
F	14' 11"	1' 7"	1' 7"	6	9' 1"
G	18' 6"	2' 3"	2' 2"	6	8' 7"
H	15' 0"	11"	1' 8"	0	7' 7"
I	14' 10"	1' 6"	2' 4"	0	7' 0"
J	11' 8"	8"	1' 11"	0	9' 7"

STRUCTURES WEST OF PUEBLO DEL ARROYO

Kiva	Diameter at floor	Width of bench	Height of bench	Number of pilasters	Ceiling height
a	12' 6"	6"	1' 10"	0	7' 0" <i>e</i>
b	11' 7"	6"	2'	0	7' 0" <i>e</i>
c	17' 3"	1' 7"	2' 2"	0	8' 0" <i>e</i>
d	15' 3"	?	?	?	7' 0" <i>e</i>

GREAT TOWER ⁵

Maximum diameter 73' 3".

Diameter of inner room 33'.

⁵ The Great Tower had been almost wholly razed before abandonment of Pueblo del Arroyo; but little remained of its inner room, and the highest wall, on the east, stood only 35'. No data exist on which to estimate the ceiling heights of its incorporated chambers.

APPENDIX C

TABLE OF ROOM FIXTURES AND FITTINGS

By HENRY B. ROBERTS

Room		
1	Doorway:	Door broken through N. wall 4' 2" from NE. corner 5" above floor, 20" w. x 36" h. x 33" across sill.
	Fireplace:	Stone lined, 11" w. x 17" E.-W. x 8" d., 3'3" from N. door and 3' 2" from W. wall. Two thin, slightly worn metates on edge form fire screen, 16" h. x 27" l., 8" S. of fireplace; E. edge of first slab is on a line with the E. end of fireplace. Small irregular hole had been broken through S. wall back of screen as ventilator.
2	Hatchway:	Entrance was through a hatchway the exact position of which is unknown.
	Ceiling:	Single N.-S. beam; 5 secondary E.-W. beams and smaller poles.
2 B	Doorway:	In E. wall, south jamb 3' 4" from NE. corner.
3	Hatchway:	In SW. corner, probably 16" w.
	Ceiling:	Single N.-S. beam supported E.-W. lesser beams and poles. Ends of lesser beams rested on log embedded longitudinally in W. wall. In NW. corner, 5½" from N. wall and 6" from W., 13" w. x 20" N.-S. x 14" d.; basin lined with small stone slabs, S. end rounded and plastered.
	Ventilator:	In S. wall flush with W., 6½" w. x 19" h., sill 6" above floor; connects with outside shaft, 13" l. x 6" w. x 15" d., covered with inverted metate, 22" l. x 18" w. x 4" th., through which an oval opening 7½" x 12" had been cut.
	Screen:	Stone slab 21" N. of ventilator, 18" E.-W. x 25" h.; E. end supported on S. side by two upright stones embedded in floor, on N. side by discarded metate; total length of screen 24" E.-W.
4	Doorways:	(a) E. door, 17" w. x 23" h. x 14" across sill, 9" from SE. corner, and 20" above floor was

(Continued)

TABLE OF ROOM FIXTURES AND FITTINGS—

continued

Room		
4		provided with secondary jambs for doorslab from Room 5 and rounded adobe step 5" w. x 20" N.-S.; (b) S. door, 19" w. x 24" h., 14" from SE. corner and 14" above floor.
	Wall niche:	In N. wall, 6" from NW. corner, 3' 3" above floor, 22" w. x 13" h. x 14½" d., plastered.
	Ceiling:	Single N.-S. beam socketed in N. wall; S. end supported by 3"-dia. post 11" from S. wall and 3' 9" from W.
5	Doorways:	(a) Blocked E. door, 22" w. x 10½" across sill, 4' 2" from NE. corner and 29" above floor; (b) W. door (see E. door, Room 4).
	Wall niche:	In E. wall, 10" from NE. corner, 3' 4½" above floor, 3½" w. x 4" h. x 5" d., plastered.
	Blocked beam hole:	N. wall, 3' 10" from NE. corner, 4' 7" above floor, 11" dia.
	Mealing bin:	Abutting S. wall 18" from SW. corner, slab sides embedded in floor. Bin contained an ungrooved metate 8" w. x 19" l., set in clay with its E. end 2" below floor level and its W. end 5½" above. Accompanying mano 4" w. x 7" l. x 1½" th.
	Fireplace:	Fan-shaped in E. end of room, 26" N.-S. x 18" x 10" d., slab sides, clay floor.
6	Doorways:	(a) Blocked S. door, 9" from SW. corner, 16" above floor, 15" w., jambs 17" h. to top of broken wall; (b) blocked W. door, 3' 10" from NW. corner, 28" above floor, 23" w. x 14½" h. to top of broken wall.
	Blocked beam hole:	N. wall, 4' 8" above floor and 34" from NW. corner.
	Fireplace:	In NE. corner, 17" w. x 22" l. x 7" d., abutting N. wall 4" from E., sides of masonry and slabs on end.
	Floor basins:	(a) S. side of fireplace forms N. side of semicircular basin, 9" w. x 14" E.-W. x 3" d., clay lined and slab floored; (b) semicircular basin 13" w. x 17" E.-W. x 2" d., lies 28" from E. wall and 26" from N., flattened side to S.
8	Doorways:	(a) Blocked N. door, 21" w. x 32" h., 6" from NE. corner, sill height 20". Above this blocked door is an open one, sill 5' 1½" from floor, that probably opened from Room 10 to roof of 7.

(Continued)

TABLE OF ROOM FIXTURES AND FITTINGS—

continued

Room		
8	Fireplaces:	(a) Clay-lined, 9" from W. wall and 4' 4" from N., 20" dia. x 8" d.; (b) abutting W. wall 21" from S., 14" x 18" N.-S. x 6" d.
	Ceiling:	Single beam socket, N. wall, about 11" dia.
	Doorways:	(a) N. wall 6' 6" from NE. corner, 14½" above floor, 28" w. x 3' 8" h. x 29" across sill; 8 lintel poles; single, secondary lintel 4" below is recessed 5"; (b) E. door, 18" from NE. corner and 32" above floor, 18" w. x 36" h. x 32" across sill.
	Ventilator:	W. wall abutting N., 6' above floor, 11" w. x 12" h. x 35" across sill.
	Ceiling:	Intact except for hole broken through SW. corner. Four N.-S. beams support 6 pairs of E.-W. poles, split cedar above.
8 B-I	Doorways:	(a) N. wall flush with W. 31" above floor, 25" w. x 38" h., blocked, leaving plastered recess 15" d.; (b) E. door T-shaped, upper portion 29" from NE. corner, 26" w. x 31" h. with secondary jambs 3½" w. on N. and 5½" w. on S.; lower part, 20" above floor, 17" w. x 13" h., blocked to leave recess 12" d.; (c) in S. wall, 25" from SE. corner and 7" above floor, 20" w. x 32" h. x 26" across sill; (d) second S. door, 13" from W. wall 19" w., with broken sill 13" above floor.
	Fireplace:	Against S. wall 12" from SE. corner, 14" N.-S. x 24" x 1½" d., rimmed with adobe; at its NE. and NW. corners shallow basins, 5" dia., as pot rests.
	Floor basin:	Against N. wall 37" from NE. corner slab-floored, adobe-rimmed basin, 10" w. x 20" l. x 1½" d.
	Ceiling:	Fragments of roofing clay 5" th. show imprints of split cedar shakes.
8 B-II	Doorway:	Possible E. door flush with S. wall.
9	Doorways:	(a) N. wall, 11' 5" from NW. corner, 25" above floor, 20" w. x 29" h., 26" across sill; (b) W. wall, 20" from NW. corner, 23" above floor (see E. door Room 8); (c) S. wall, 5' 7" from SW. corner, 18" above floor, 17" w. x 33" h. x 33" across sill (see N. door, Room 1).
	Ceiling:	15½' at W. end intact. Paired N.-S. beams 8" dia., pairs average 4' 1" apart; on beams.

(Continued)

TABLE OF ROOM FIXTURES AND FITTINGS—
continued

Room		
9		paired E.-W. poles averaging 3" dia. x 7' long, pairs 6" apart and butt to tip. Above poles, a layer of split cedar extending N.-S., tenoned into side walls and secured by long cedar splints laid at intervals directly above the E.-W. poles and bound to them by yucca strips; next, a layer of juniper bark and then 5" of adobe mud as flooring for second-story room.
	Fireplace:	24' 3" from E. wall and 3' from N., 11" w. x 18" E.-W. x 2" d., clay lined.
9 B-I	Doorways:	(a) Blocked N. door, 6' 10" from NE. corner, 25" w. x 3' 3" h.; (b) S. door, 10' from SW. corner, measurements not determinable.
	Ventilator:	S. wall 8" from SE. corner, 5' 3" above floor offset, 11" w. x 10½" h. x 26" across sill.
	Wall supports:	E. and W. walls stand on paired logs built into N. and S. walls at floor level.
9 B-II	Doorways:	(a) N. wall 7' 5" from NE. corner, 23" w. x 26" across sill; (b) S. door 8' 4" from SE. corner 19" w.
	Wall supports:	E. and W. walls supported as in 9B-I.
9 B-III	Doorways:	(a) N. wall 6' 7" from NE. corner, 31" above floor, 26" w. x 3' 2" h. x 27" across sill, 8 lintel poles; 2" below main lintels, recessed 4½" to support door slab; (b) in W. wall T-shaped door, upper part 26" from NW. corner (see E. door Room 8 B-I); (c) in S. wall T-shaped door 6' 5" from SE. corner, upper part 29" w. x 27" h. to broken top; lower part 20" w. x 32" h., sill at floor. Lower 18" blocked forming new sill and concealing 3" offset in W. jamb 8" above original sill. Below rebuilt door, an adobe step 8" w. x 24" E.-W. x 3" h.
	Fireplace:	Semicircular, against S. wall 25" from SW. corner; inside measurements 17" x 16"; raised adobe rim 6" w. x 5" h.
	Floor basins:	Against N. wall 3' 1" from NW. corner, 10" w. x 33" N.-S. divided by 2"-w. clay partition; N. part 9" w. x 17" l. x 2" d., has stone disk 7" dia. embedded in its floor; S. basin, 11" w. x 12" l. x 3" d., floored with stone slab 7" w. x 9" l. Part of an adobe rim 5" w. x 4" h. remains at SE. quarter.

(Continued)

TABLE OF ROOM FIXTURES AND FITTINGS—
continued

Room		
9 B-III	Floor repairs:	Extending 5' 10" from E. wall a second layer of adobe 4" thick levels sunken area in floor.
10	Doorways:	(a) In E. wall 11" from SE. corner and 24" above floor, 15" w. x 19" h. x 14" across sill; (b) door through S. wall 7' 4" from SE. corner and 17" above floor, 20" w. at bottom, 18½" w. at top x 25" h., blocked from Room 7 to leave 24"-deep recess in Room 10. Apparent steps: 18" above sill and recessed 5" from wall face, a small pole crosses the opening; a second pole parallels the first 3" higher and 10" from wall face. Main lintels 25" above sill with first one recessed 20"; 7" of masonry upon lintels. Directly above this blocked door is another (c), its W. jamb being a continuation of that below. This upper door, recessed 13", is 22" w. x 37" h. x 17" across sill; latter is 35" above that of lower blocked door or 4' 4" above floor of room.
	Fireplace:	23½" from N. wall and 5' 4½" from E., 15" sq. x 7" d., lined with 4 slabs. Bottom of fireplace is an earlier floor.
10 B	Doorways:	(a) Blocked N. door 6' 10" from NE. corner, 25" w. x 35" h.; (b) in S. wall a door, which we restored as T-shaped, 4' 11" from SE. corner, 27" w. x 31" h. x 25" across sill, lower part 4' 9" from SE. corner is 21" w. x 17" h., sill 13" above floor offset.
	Ventilator:	S. wall, 5" from SW. corner, 10" w. x 12" h. x 26" across sill.
	Wall supports:	E. and W. walls supported on paired beams as in Room 9 B-I.
11		Excavated W. end only.
11 B	Doorway:	N. wall 8' 9" from NE. corner, 18" above floor offset; 24" w. x 3' 5" h.
12	Doorway:	N. wall 6' 9" from NE. corner at floor level, 24" w. x 3' 6" h.
	Ceiling:	Poles upon cross beams, split cedar layer bound to poles by strips of cedar tied with yucca-leaf thongs; layers of cedar bark and mud.
12 B	Doorways:	(a) N. wall 6' 10" from NE. corner and 19" above floor, 25" w. x 26" across sill; (b) blocked S. door 6' 7" from SE. corner and 24" above floor, 25" w. x 37" h.

(Continued)

TABLE OF ROOM FIXTURES AND FITTINGS—
continued

Room		
13	Doorway:	N. wall 6' 7" from NE. corner and 12" above floor, 26" w. x 3' 6" h. x 26" across sill.
13 B	Doorways:	(a) N. wall 6' 10" from NW. corner, approximately 24" w. x 28" across sill; (b) blocked S. door 6' 8" from SW. corner and 21" above floor, 25" w. x 3' 5" h.
14	Doorway:	N. wall, 6' 11" from NE. corner and 8" above floor, 24" w. x 3' 10" h.
14 B	Doorways:	(a) N. wall, 6' 9" from NE. corner, 20" above floor offset, 25" w. x 3' 6" h. x 26" across sill; (b) S. wall 7' 3" from SE. corner, 18" above floor, 25" w. x 26" across sill.
15	Doorways:	(a) N. wall 6' 4" from NE. corner and 6" above floor, 27" w. x 3' 7" h. x 27" across sill, lower 5" blocked to form recess 9" d.; (b) S. wall 27" from SE. corner and 22" above floor, 21" w. at bottom, 17" w. at top x 30" h. x 27" across sill.
15 B	Doorways:	(a) N. wall 6' 2" from NE. corner, 25" w. x 25" h. x 25" across sill; (b) in S. wall (see N. door Room 9 B-111).
16	Doorways:	(a) N. wall 6' 6" from NE. corner, 5" above floor, 26" w. x 3' 11" h., blocked to leave 8"-d. recess; single secondary lintel 4" below main lintels and 4" from face of wall; (b) in S. wall 6' 5" from SE. corner and 6" above floor, 28" w. x 3' 9" h. x 29" across sill (see N. door, Room 8).
	Ceiling:	E. half intact. Two N.-S. beams 6' 10" above floor; 16 E.-W. ceiling poles; split cedar, bark, and adobe.
16 B	Doorways:	(a) N. door 6' 9" from NE. corner, 25" w., lower 13" blocked to form plastered recess 9" d.; (b) blocked door in S. wall (see N. door, Room 8 B-I).
17		Unexcavated.
18		Unexcavated.
19		Unexcavated.
19 B		Unexcavated.
19 C	Doorways:	(a) Blocked E. door, 38" from SE. corner, 20" above floor, 28" w.; (b) in S. wall, 9' 2" from SE. corner and 20" above floor, 26" w., provided with secondary jambs to support door slab.

(Continued)

TABLE OF ROOM FIXTURES AND FITTINGS—
continued

Room		
20	Doorway:	S. wall 7' from SE. corner and 7" above floor, 23" w. x 3' 7" h. (see N. door, Room 12).
	Ceiling:	4' at W. end intact. N.-S. beams overlain with ceiling poles, split cedar, and 5"-layer of mud (bark omitted).
	Hatchway:	In SE. corner, 25" w. x 37" E.-W.
	Fireplace:	Oval depression in floor, 4' 9" w. x 5' 4" E.-W. x 11" d., 17" from N. wall and 5' 2" from E., clay lined; subsequently floored over except for 11"-square firebox left at east end.
20 B	Doorway:	S. wall 7' from SE. corner and 18" above floor offset, 25" w. x 26" across sill.
21	Doorway:	S. wall 6' 7" from SE. corner and 9" above floor (see N. door, Room 13).
22		Unexcavated.
22 B	Doorways:	(a) N. wall (see S. door, Room 28 B); (b) S. wall (see N. door, Room 14 B).
23	Doorways:	(a) N. wall 4' 8" from NE. corner and 6" above floor, 26" w. x 3' 7" h. x 27" across sill; (b) S. wall 6' 4" from SE. corner and 11" above floor (see N. door, Room 15).
23 B	Doorways:	(a) N. wall 6' 10" from NE. corner and 32" above floor offset, 26" w. x 36" h. x 25" across sill, lower 12" blocked; (b) in S. wall 6' 7" from SE. corner and 31" above floor offset (see N. door, Room 15 B).
23 C	Doorway:	N. wall 8' 10" from NE. corner and 19" above floor offset, 26" w. x 3' 5" h. x 24" across sill.
24	Doorways:	(a) N. wall 9' 9" from NE. corner and 5" above floor, 27" w. x 3' 10" h.; (b) S. door 6' 9" from SE. corner and 5" above floor (see N. door, Room 16). In W. wall T-shaped door sealed with large rough sandstone blocks; upper part, 33" w. x 28" h., abuts S. wall; lower part, 5" from SW. corner, approximately 19" w. x 13" h. with sill about 28" above floor.
	Ventilator:	W. wall flush with NW. corner, 5' 10" above floor, 11" w. x 12" h., blocked from outside.
24 B	Doorways:	(a) N. wall 7' 3" from NE. corner and 31" above floor offset, 26" w. x 37" h. x 27" across sill, lower 9" blocked; (b) S. door 7½" from SE. corner, 31" above floor offset, lower 10" blocked (see N. door, Room 16 B).

(Continued)

TABLE OF ROOM FIXTURES AND FITTINGS—

continued

Room 25	Doorways:	(a) E. wall 6' 7" from NE. corner and 6" above floor, 25" w. x 4' h. x 30" across sill; (b) in S. wall 39" from SE. corner, 4" above floor, 29" w. x 49" h. (see N. door, Room 24).
	Ventilators:	W. wall: (a) flush with N. wall, 5' 10" above floor, 12" w. x 11" h.; (b) 5" from SW. corner, 5' 6" above floor, 10" w. x 14½" h.
25 B	Doorways:	(a) E. wall 6' 10" from NE. corner, 25" w.; (b) in S. wall 10" from SE. corner and 31" above floor offset (see N. door, Room 24 B); (c) in W. wall 30" from NW. corner and apparently at floor offset, 17" w. x 20" across sill.
26	Doorways:	(a) Blocked E. door 7' from NE. corner and 8" above floor, 26" w. x 3' 9" h.; (b) in W. wall, 6' 10" from NW. corner and 6" above floor (see E. door, Room 25).
26 B	Doorways:	(a) E. wall 7' 2" from NE. corner, 20" above floor offset, 23" w. x 3' 11" h. x 28" across sill; (b) W. wall 6' 10" from NW. corner (see E. door, Room 25 B).
26 C	Doorway:	E. wall, 25" w. (see W. door, Room 27 C).
27	Doorways:	(a) Blocked E. door 7' 10" from NE. corner and 6" above floor, 26" w. x 3' 6" h.; (b) S. wall 4' 6" from SE. corner and 6" above floor (see N. door, Room 23); (c) W. wall 7' from NW. corner and 8" above floor, blocked from Room 26 to form recess 26" w. x 3' 8" h. x 15" d.
27 B	Doorways:	(a) E. wall 7' 3" from NE. corner, 24" above floor offset, 24" w. x 4' h. x 25" across sill; (b) S. wall 20" from SW. corner, 19" above floor offset, 24" w. x 3' 4" h. x 25" across sill, lower 11" blocked (see N. door, Room 23 B); (c) in W. wall, 7' 4" from SW. corner, 23" above floor offset (see E. door, Room 26 B).
27 C	Doorways:	(a) E. door 6' 2" from SE. corner; (b) S. door flush with W. wall, 26" w. x 3' 5" h. x 24" across sill (see N. door, Room 23 C); (c) in W. wall 7' 2" from NW. corner, 25" w.
28	Doorways:	(a) S. wall 6' 6" from SW. corner, 9" above floor, 24" w. x 3' 10" h. x 26" across sill;

(Continued)

TABLE OF ROOM FIXTURES AND FITTINGS—

continued

Room 28		(b) W. door 7' from NW. corner and 8" above floor, 26" w. x 3' 8" h., blocked from Room 27 to form recess 18" d. in Room 28 (see E. door, Room 27).
	Post holes:	(a) Hole, 6½" dia. x 14" d., 7' 10" from NW. corner and 8' 3" from NE.; (b) 6" dia. x 15" d., 10' 5" from NE. corner and 10' 3" from NW.; (c) 7½" dia. x 10" d., 14' 5" from NW. and 14' 10" from NE. corners. Posts in these holes supported primary E.-W. beams.
28 B	Doorways:	(a) S. wall 6' 11" from SE. corner, 20" above floor offset, 24" w. x 3' 9" h. x 26" across sill; (b) W. wall 19" above floor offset, 25" w. x 3' 11" h. x 27" across sill (see E. door, Room 27 B).
29	Doorway:	E. wall 6' 4" from NE. corner and 12" above floor, 27" w. x 3' 5" h. x 31" across sill.
	Ventilator:	W. wall flush with S., 5' 5" above floor, 10" w. x 9" h.
29 B	Doorway:	E. wall 6' 3" from NE. corner, 29" above floor offset 24" w. x 35" h. x 26" across sill.
30	Doorways:	(a) E. wall 6' 5" from NE. corner and 3" above floor, 26" w. x 3' 5" h. x 27" across sill; (b) W. wall 6' 6" from NW. corner and 9" above floor, 27" w. x 3' 9" h. x 31" across sill (see E. door, Room 29).
30 B	Doorways:	(a) E. door 6' 3" from NE. corner, 22" above floor offset, 25" w. x 3' 6" h. x 27" across sill; (b) in W. wall 6' 7" from NW. corner and 28" above floor offset, 23" w. x 37" h. x 27" across sill (see E. door, Room 29 B).
	Ventilator:	In N. wall flush with W., 6' 2" above floor offset, 12" w. x 10" h., blocked to form recess 13½" deep.
30 B	Ceiling:	At ceiling offset, beam from Room 34 B extends through N. wall 39", partly embedded in E. wall.
30 C	Doorway:	In middle E. wall.
31	Doorways:	(a) E. door 6' 6" from NE. corner and 9½" above floor, 27" w. x 3' 6" h. x 27" across sill; (b) in W. wall 6' 5" from NW. corner and 10½" above floor, 27" w. x 3' 7" h. x 27" across sill (see E. door, Room 30).

(Continued)

TABLE OF ROOM FIXTURES AND FITTINGS—

continued

Room		
31 B	Doorways:	(a) E. wall 6' 7" from NE. corner, 24" above floor offset, 25" w. x 3' 7" h. x 25" across sill; (b) W. wall (see E. door, Room 30 B).
	Ventilator:	N. wall, 3' 10" from NW. corner, 6' above floor offset, 10" w. x 12" h., blocked to leave recess 13" d.
31 C	Doorway:	In middle W. wall.
32	Doorway:	In W. wall 6' 8" from NW. corner and 12" above floor, 26" w. x 3' 8" h. x 27" across sill (see E. door, Room 31).
	Ventilator:	N. wall 11" from NW. corner, 4' 8" above floor, 8" w. x 7" h.
	Post holes:	Under primary E.-W. beams: (a) 7" dia. x 13" d., 7' 8" from NW. and 8' 9" from NE. corners; (b) 6" dia. x 11" d., 10' 4" from NW. and 10' 11" from NE. corners; (c) 8" dia. x 12" d., 14' 1" from NW. corner and 14' 10" from NE. Holes lined with slab fragments on edge.
32 B	Doorway:	W. wall 6' 10" from NW. corner, 27" above floor offset (see E. door, Room 31 B).
	Ventilator:	Blocked ventilator in N. wall 8" from NW. corner, 6' 2" above floor, 12" w. x 13" h. (to top broken wall) x 32" across sill.
33		Unexcavated.
34	Doorways:	(a) E. wall 3' 3" from SE. corner, 18" above floor, 26" w. x 4' 8" h. x 27" across sill; (b) W. wall 32" from SW. corner and 15" above floor, 26" w. x 4' 9" h.
	Ceiling:	3 primary E.-W. beams (2 paired at S. end); post next E. wall under N. beam; 2 posts next W. wall.
34 B	Doorways:	(a) E. wall 4' 1" from NE. corner, 14" above floor offset, 26" w. x 42" (to top broken wall) x 26" across sill; (b) in W. wall, 3' 11" from SW. corner, 25" w.
	Ventilators:	In S. wall: (a) 13" from SE. corner and 5' 1" above floor offset, blocked to form recess 9" w. x 12" h. x 18" d.; (b) 8" from SW. corner, 5' 1" above floor offset, blocked to form recess 12" w. x 12" d.
35	Doorways:	(a) Blocked N. door, 4' 5" from NW. corner, 5" above floor, 25" w.; (b) in W. wall 3' 8" from SW. corner, 11" above floor (see E. door, Room 34).

(Continued)

TABLE OF ROOM FIXTURES AND FITTINGS—

continued

Room		
35	Ceiling:	Single E.-W. beam.
35 B	Doorway:	In middle E. wall, 26" w.
	Ventilators:	In S. wall: (a) 12" from SE. corner and 5' above floor offset, 12" w. x 12" h., blocked to form recess 7" d.; (b) 12" from SW. corner and 5' 11" above floor, 9" w. x 14" h.
36	Doorways:	(a) Blocked N. door 8' from NW. corner and 12" above floor, 27" w. x 4' 4" h.; (b) in E. wall 3' 7" from NE. corner, 15" above floor, 21" w. x 38" h. x 26" across sill.
	Floors:	Earlier floor at depth of 6"; at depth of 9", a roughly laid stone pavement.
	Ceiling:	3 primary N.-S. beams, average 9" dia.
36 B	Doorway:	W. wall 3' 4" from SW. corner, 26" w. x 25" across sill.
37	Doorways:	(a) N. wall 9' 9" from NW. corner, 21" above floor, 28" w. x 37" h., lower 18" blocked; (b) in W. wall 2' 10" from SW. corner, 22" above floor, 25" w. x 36" h. (see E. door, Room 36).
	Ventilator:	In S. wall 21" from SW. corner and 6' above floor, 7" w. x 13" h., blocked.
37 B	Doorway:	Blocked N. door, 9' 11" from NW. corner, 22" above floor offset, 25" w.
38		Unexcavated.
39	Doorways:	(a) Blocked E. door, 7' from SE. corner and 15" above floor (to top broken wall), 28" w. x 4' h.; (b) in W. wall, 27" from SW. corner, 9½" above floor, 27" w. x 3' 11" h. x 26" across sill.
	Posts:	Against W. wall under beams.
40	Doorways:	(a) N. door 5' 3" from NE. corner and 27" above floor, 3' 8" w. at sill, 34" w. at top x 4' 9" h., lower 3' 7" blocked; (b) E. door 5' 3" from SE. corner, 18" above floor, 29" w. x 3' 11" h., lower 31" blocked; (c) blocked S. door 7' 10" from SW. corner, 20" above floor, 27" w. x 4' 9" h. (see N. door, Room 36); (d) blocked W. door 5' 10" from SW. corner, 12" above floor, 38" w. x 3' 7" h.
	Wall repairs:	Two areas show ancient repairs, W. wall at beam height: (a) 3' 9" and (b) 7' 6" from SW. corner.
	Fireplaces:	(a) Semicircular, adobe lined, 5' 5" from SW. corner, 13" w. x 19" E.-W. x 8" d.,

(Continued)

TABLE OF ROOM FIXTURES AND FITTINGS—

continued

Room 40		underlies S. wall 4"; (b) adobe lined, 4" from N. wall and 6" from E., 28" E.-W. x 30" x 6" d. In SE. corner 6" from E. wall and 25" from S., an irregular clay-lined depression, 38" x 39" E.-W. x 10" d., slightly burned and ash filled.
	Ceiling:	Four large N.-S. beams, one of them against W. wall to support ends of 29 overlying ceiling poles, socketed in E. wall only.
	Post hole:	Clay lined, 8" dia. x 16" d., 23" from E. wall and 4' 6" from N.
40 B	Doorway:	Blocked W. door 6' 4" from SW. corner, sill at floor offset, is 25" w. for lower 19" at which point N. jamb has 5" offset, increasing width to 30"; a second offset, 4" w., occurs in N. jamb 28" above sill; total height, 3' 6" to top broken wall.
41	Doorways:	(a) Blocked N. door 5' 8" from NW. corner, 12" above floor, 26" w. at sill, 23" w. at top, x 4' h.; (b) open door, N. wall 3' 11" from NE. corner, 30" above floor, 23" w. x 5' h. (to top broken wall), has 4 built-in steps leading to roof of Kiva J. At level of second step, 2' 3" above sill, both jambs were torn out and replaced with new masonry; (c) door in E. wall 8' 1" from SE. corner, 18" above floor, 25" w. x 3' 3" h. x 28" across sill, lower 28" blocked; (d) in S. wall 9' 7" from SW. corner and 4" above floor, 29" w. x 4' 4" h., lower 27" blocked; (e) in W. wall, 5' 2" from SW. corner, 8" above floor, 28" w. x 4' 1" h. x 29" across sill, blocked to height of 6", recessed 3" and then roughly blocked 18" higher.
	Wall niche(?):	Coarsely blocked opening, N. wall, 9' 2" from NE. corner and 31" above floor, 3' 9" w. x 28" h. to lintel poles.
	Fireplace:	18" dia., 38" from E. wall and 4' 4" from N., shallow, clay lined, and slightly burned.
	Mealing bins:	Stripped foundation trench, 19" w. x 6' 3" E.-W. x 5" d., W. end 37" from N. wall of room, E. end 3' 5" from N. and 5' from E. wall. Adjoining E. end of trench, slabs on edge form clay-lined basin, 13" w., filled with ash and charcoal; at W. end of trench, slabs

(Continued)

TABLE OF ROOM FIXTURES AND FITTINGS—
continued

Room		
41		on edge project 5" above floor to form bin 16" w. x 23" E.-W. x 6" d., slab on E. side projects 12" and extends 10" to N.
41 B	Doorways:	(a) N. wall 10' 3" from NW. corner, 10" above floor offset, 26" w.; (b) in S. wall 9' 10" from SW. corner, 21" above floor offset, 25" w. (see N. door, Room 37 B). Unexcavated.
42		
43	Doorways:	(a) E. wall 7' from NE. corner, 17" above floor, 27" w. x 4' 8" h. x 28" across sill, lower 14" blocked; stone on edge in floor forms step, 15" w. x 10" h. x 3½" d.; (b) door in W. wall, 4' 7" from SW. corner, 14" above floor, 25" w. x 3' 9" h., lower 15" blocked to provide new sill 29" above floor with plastered secondary jambs set in 9" from wall face reducing door width to 14"; (c) second W. door, flush with N. wall and 21" above floor, 25" w. x 29" h. to lintels; secondary jambs and new lintels reduced door to 16" w. x 22" h.
	Ceiling:	2 pairs E.-W. primary beams, 10-11" dia. with overlying poles, split cedar, etc. Posts, 5-6" dia., stood next walls under both ends of S. beam in N. pair, under E. end of S. beam in S. pair.
	Subfloor:	Earlier, less even floor at depth of 3".
44	Doorways:	(a) In E. wall 17" from NE. corner and 35" above floor, 26" w. x 35" h. to lintels at level of ceiling poles. In NE. corner, block of masonry 38" w. x 3' 11" N.-S. has 3 steps on W. side leading to sill; their average rise and tread are 10" and 11" respectively; a 4th step lies below floor level. From sill of door 5 built-in steps lead to roof of Kiva F. (b) In W. wall 7' from SW. corner, sill at floor level, 27" w. x 36" h., lower 14" blocked from Room 43 forming recess 10" d. in 44 (see E. door, Room 43).
	Ceiling:	Largely intact. 2 E.-W. beams, average 11½" dia., plus secondary logs, layer of split cedar, ½" of adobe, then cedar bark, and 3" of adobe as floor of Room 44 B. Posts, 8" dia., next walls under both ends of N. beam and under E. end of S. beam stand on slabs 4' 4" below floor.

(Continued)

TABLE OF ROOM FIXTURES AND FITTINGS—
continued

Room		
44	Hatchway:	In ceiling, 22" from S. wall and 5" from E., 12" w. x 17" E.-W.
	Painting:	On N. wall, white drawing of sandal, 7 $\frac{3}{4}$ " l. x 3 $\frac{3}{4}$ " w., for right foot, notch on side.
	Wall niche:	In N. wall 6 $\frac{1}{2}$ " from NW. corner and 3' 11" above floor, 6" w. x 2 $\frac{1}{2}$ " h. x 4 $\frac{1}{2}$ " d., plastered; bottom corners rounded, upper corners squared.
	Fireplace:	Slab-lined 9' 4" from SW. corner of room and 10' 6" from SE. corner, 20" w. x 22" E.-W. x 7" d.
	Floors:	(a) At depth of 18" (17" at W. end), uneven floor. On it, in SE. corner, unplastered masonry bin 45" w. x 47" E.-W. x 17" d., filled with sand and debris of reconstruction. Semicircular end of ventilator duct from Room 47 subfloor kiva 5' 4" from NW. corner. Slab-lined fireplace 32" dia. x 13" d. is 21" from E. wall and 32" from masonry bin. Bottom step of NE. masonry stairway on this floor. (b) At additional depth of 15 $\frac{1}{2}$ " a second subfloor, probably the original, overlain by debris of occupation and sand. From this floor to ceiling beams is 7' 10 $\frac{1}{2}$ ".
44 B	Doorways:	(a) Blocked N. door 5' 4" from NW. corner at floor level, 27" w. x 28" across sill; (b) E. wall 7' 2" from SE. corner at floor level, 26" w. x 27" across sill, lower 6" blocked and recessed 8"; (c) in S. wall, blocked T-shaped door 5' 10" from SW. corner, sill 15" above floor, lower portion is 20" w. x 13" h.; off-sets of 12" on W. jamb and 8" on E.; upper part 3' 4" w. x 15" h. to top broken wall.
45		Unexcavated.
46		Reclaimed portion of room sacrificed to Kiva E.
	Ceiling:	A single 10"-dia. E.-W. beam; 13 ceiling poles of which only 5 are tenoned in N. wall; on poles, a layer of split cedar. Purposeful fill on original floor 8' 1" below beam leaves 3' 8" clearance. Posts against walls under beam ends stand on slabs 4 $\frac{1}{2}$ " below original floor.
	Hatchway:	In SE. corner against S. wall, 24" from E., 19" w. x 24" N.-S.

(Continued)

TABLE OF ROOM FIXTURES AND FITTINGS—

continued

Room		
46 B	Doorways:	(a) Blocked T-shaped door in E. wall, sill at floor level, abutted by N. wall; S. jamb of lower section 12" from NE. corner is 3' h.; from 11½"-w. offset S. jamb of upper part rises 18" to broken top of wall. (b) Blocked W. door 24" above floor, S. jamb 18" from NW. corner, also abutted by built-in N. wall.
47		Part of former dwelling that made way for Kiva E and was filled ceiling high.
47 B	Doorways:	(a) Blocked E. door 29" from SE. corner, 11" above floor offset, 19" w.; (b) in S. wall, blocked door 5' 8" from SW. corner, 24" w. x 30" h.; (c) in W. wall, blocked T-shaped door flush with NW. corner; lower part 6" above floor offset, 15" w. x 30" h.; from 10" w. offset upper part is 20" h.
	Floor:	Two masonry-enclosed N.-S. beams as former wall support rest upon floor offset 3' 5" from SW. corner and 3' 8" from NW. corner. Beams adzed on top; floor sunken 5" on E. side, 10" on W.
	Fireplaces:	(a) Against blocked S. door, 10" E.-W. x 12" x 9" d., partly slab lined and plastered, contained 2 stone firedogs; (b) 3' 6" from NE. corner, 14" E.-W. x 19" x 4" d., slab floored and clay lined; (c) probable hearth 5' from E. wall and 37" from S., 23" dia. x 5" d.
	Bin:	Abutting NW. corner, 17" E.-W. x 22" x 9" d.; E. and S. sides of plastered masonry. Ash filled but unburned.
48		Unexcavated.
49		Unexcavated.
50		Unexcavated.
51	Doorways:	(a) N. wall 4' 8" from NW. corner, 25" above floor, 25" w. x 38" h., lower 12" blocked; (b) E. door 6' 8" from SE. corner, 16" above floor, 28" w. x 4' 7" h., lower 28" blocked; (c) E. wall 10" from SE. corner and 30" above floor, recessed door connecting with Room 52 B is 26" w. x 6' 7" h. x 23" across sill; has 11 small lintel poles, those on W. at ceiling-pole height and those on E. side 6" higher. Below sill, 10"

(Continued)

TABLE OF ROOM FIXTURES AND FITTINGS—
continued

Room		
51		from S. wall, is platform step 31" N.-S. x 35" x 10" h. (d) Door in W. wall 5' 8" from SW. corner and 17" above floor is 26" w. x 3' 10" h.
	Ventilator :	In E. wall 7' 4" from SE. corner and 8' 2" above floor, 15" w. x 17" h., blocked.
	Wall niche :	In W. wall 8" from SW. corner and 3' 4" above floor, 12" w. x 15½" h. x 7½" d.
	Fireplace :	35" from E. wall and 6' from N., 14" E.-W. x 26" x 14" d., lined and floored with slabs.
51 B	Doorway :	Probable E. door, 37" from SE. corner.
	Repository :	In NW. corner at junction of 4 walls, two beams supporting S. wall of Room 53 B extend 6" east of corner. Built in upon their extended ends is a semicircular bit of masonry 14" l. x 10" h., open to E. and partly covered by an inverted, broken metate.
52		Unexcavated.
52 B	Doorways :	(a) Blocked E. door 38" from SE. corner and 8" above floor, 29" w. In floor at SW. corner, a masonry-lined vestibule 24" N.-S. x 21" x 27" d., connects with door leading down to Room 51 A.
	Timber :	Roughly hewn cedar timber 12" w. x 29" l. x 7" th., one end half buried in floor 7" W. of E. door.
53		Unexcavated.
54	Doorways :	(a) Blocked N. door 5' 1" from NW. corner, 15" above floor, 26" w. x 3' 8" h.; (b) in E. wall 34" from SE. corner, 14" above floor, 29" w. x 3' 6" h., lower 14" blocked; secondary lintels with 2" masonry fill above; (c) in S. wall 5' from SW. corner and 25" above floor (see N. door, Room 51); (d) in W. wall 33" from SW. corner, 9" above floor, 28" w. x 3' 7" h., lower 12" blocked.
	Ventilator :	In W. wall 25" from NW. corner, 5' 5" above floor, 11½" w. x 8" h.
	Recess :	Blocked recess W. wall, 9' 1" from SW. corner, 3' 5" above floor, 12" w. x 31" h.
	Subfloors :	Earlier floors at depths of 1¼" and 4¼".
55	Doorways :	In E. wall: (a) 5' 1" from NE. corner, 24" above floor, 20" w. x 31" h. x 27" across sill, with secondary jambs to support a door slab; (b) blocked E. door 11' 2" from NE. cor-

(Continued)

TABLE OF ROOM FIXTURES AND FITTINGS—
continued

Room

55

ner, 3' 3" above floor, 23" w. x 34" to top broken wall; (c) another blocked E. door, 4' 7" from SE. corner, 3" above floor, 28" w. x 4' 6" h., reduced to 19" w. x 3' 5" h. by secondary jambs and 13" of masonry on old sill then wholly blocked and plastered over; (d) open E. door 16" from SE. corner and 35" above floor, 22" w. x 38" h., with two built-in steps; (e) in W. wall 9' 4" from SW. corner, 3" above floor, 28" w. x 5' h., lower 18" blocked (see E. door, Room 54).

Wall drawings: On S. wall plaster, 2 human figures and 3 left hands drawn with white chalk.

Floor depressions: Against S. wall, 3' 6" from SW. corner, 18" E.-W. x 38" x 5" d., clay lined with upright slab on S. half of E. side; 2" N. of this depression is a second, 14" E.-W., 4' 5" x 4" d., slab lined and floored; N. half is 12" w. and not slab lined

Mealings bins: Parallelling E. side of room at 19", 4' from S. wall; over-all width 36" x 12' 8" N.-S. Room floor higher on E. side; metate seatings, 23" w., slope down from floor level 5" to edge of meal trench. Latter is 13" w. x 6" d., its bottom 3" below lower edge of metate seatings. Trench lined and floored with slab fragments bedded in mud; S. end closed by tabular metate on edge 27" l. and standing 7" above room floor. Embedded in trench floor at N. end is dressed pine plank 5" w. x 25" l. x $\frac{1}{2}$ " th. All framing and most of flooring slabs removed when bins were dismantled.

Subfloor: Earlier floor 5" below; on it a trench 11" w. x 3 $\frac{1}{2}$ " d. crosses N. end of room and is floored with a single plank 10 $\frac{1}{2}$ " w. x 12' l. x 1" th.

55 B

Doorway: N. wall 5' 8" from NE. corner, sill at floor level, 21" w. x 38" h. (to top broken wall), lower 6" blocked leaving an 8"-deep recess, then blocked an additional 9" leaving an 11"-deep recess, then blocked to broken top of wall.

56

Doorways: (a) Blocked E. door 15" from SE. corner has wooden sill 5 $\frac{1}{2}$ " above floor, 18" w. x 30" h.; (b) in W. wall 16" from SW. cor-

(Continued)

TABLE OF ROOM FIXTURES AND FITTINGS—
continued

Room		
56		ner, 24" w. x 22" h. (see door, SE. corner Room 55).
	Post:	21" from NE. corner and 4" from N. wall is 3"-dia. post, present height 16".
57	Doorway:	In W. wall 17" from SW. corner and 6" above floor, 15" w. x 27" h., blocked to form 7"-deep recess (see E. door, Room 56).
58		An apparently open room built, like 56 and 57, on fill following construction of Kiva H.
	Doorways:	(a) Blocked T-shaped door in E. wall 12" above floor; lower section, 4' 7" from SE. corner, is 26" w. x 33" h.; upper part 41" w. x 29" h.
	Subfloor:	In SE. corner, earlier floor at depth of 4' 10".
60		Open work space.
	Fireplace:	Against W. wall 30" from SW. corner, oval, 12" E.-W. x 23" x 8" d. In open space 11' 8" N. of Room 60 and 28" from W. wall is a slab-lined fireplace, 12" square by 7" d.
61		Open work space.
	Posthole:	In SW. corner 8" from S. wall and 7" from W., 4" dia., x 10" d.
62	Doorways:	(a) In E. wall blocked T-shaped door 30" above floor, lower section 14" from SE. corner is 21" w. x 28" h.; jambs of upper portion, 24" h., are offset 9" on S. and 6" on N. Lower part provided with lintels and blocked to leave 12"-deep recess in which, against N. jamb and 13" above sill, is an opening 6" w. x 5" h.; upper part recessed an additional 6½", blocked and plastered. (b) In S. wall 5' 3" from SE. corner (see N. door, Room 40).
63	Doorway:	Blocked E. door 13' 3" from NE. corner and 21" above floor, 27" w.
	Fireplace:	Masonry lined and floored with clay, 23" from E. wall and 6' 9" from S., 30" N.-S. x 31" x 31" d.
	Slab:	Set on edge in floor 12' 8" from N. wall and 26" from E., sandstone slab 15" E.-W. extends 7" above floor and 12" below.
	Subfloor:	Earlier floor at depth of 16".
64	Doorways:	(a) Blocked E. door 3' from NE. corner and 18" above floor, 21" w. x 3' 4" h.; (b) blocked W. door is 4' 6" from NW. corner and 21" above floor, 17" w. x 29" h.

(Continued)

TABLE OF ROOM FIXTURES AND FITTINGS—
concluded

Room		
64	Recess:	In W. wall against SW. corner 3' 10" above floor, wall recess 15" w. x 5½" h. at S. and 3½" h. at N. x 10" d., with slab sill protruding 1".
65	Doorway:	Blocked E. door (see W. door, Room 64).
	Recess:	In E. wall 4' from NE. corner and 4' 4" above floor, 7" w. x 9" h., neatly blocked and plastered over. Does not show in Room 64.
	Subfloor:	Earlier floor at depth of 4".

APPENDIX D

PARTIAL LIST OF WALL REPAIRS AT PUEBLO DEL ARROYO MADE BY THE NATIONAL GEOGRAPHIC SOCIETY'S PUEBLO BONITO EXPEDITION

By HENRY B. ROBERTS

<i>Room</i>	<i>Description</i>
9 A	N. wall: Replaced lintels N. door, repaired upper jambs and 3 sq. ft. above; 6-sq.-ft. patch 15 ft. from NE. corner. S. door: Replaced 2 lintels, repaired upper W. jamb and 1 ft. above, also sill and 10 inches below. W. door into Room 8: Replaced lintels, repaired jambs and 1 ft. above.
9 B-I	Outer S. side: Ventilator jambs; minor patches at floor level, replaced door lintels and surrounding 20 sq. ft. above Room 5.
9 B-II	E. wall: Rebuilt part of wall on new supporting beams. Outer S. side: 3-sq.-ft. patch in middle and repairs at floor level above Rooms 3-4.
10 B	N. floor offset, entire length: Placed new beams under E. wall and rebuilt upper 2 ft. S. door: Repaired as T-shaped, with outside patching about door and at floor level above Room 6-7.
11 B	N. floor offset and 35 sq. ft. above door: Replaced 2 beams supporting E. wall and rebuilt 3 ft above. Outer S. side: 3-sq.-ft. patch at W. end and rebuilt top 2 ft. of wall.
12 A	N. wall: Patched recent hole broken through upper W. end.
B	E. wall: 2-sq.-ft. patch.
18 B	W. side: 30 sq. ft. along and below floor offset; beam reset.
C	W. side: Along floor offset for 10 ft.
— B	Unnumbered room next N. of 18, E. door: Upper jambs and 3 lintels. W. door: Small patch on S. jamb.
C	N. wall: 3-sq.-ft. patch; floor offset and 12 sq. ft. above.
19 B	Middle S. wall: 6-sq.-ft. patch; 2 beam holes repaired.
C	S. door: Sill, E. jamb, lintels and 3 sq. ft. above. Minor repairs along floor offset.
23 B	N. door: Upper jambs, lintels, and 5 sq. ft. above to third story floor offset.
26 B	W. door: Jambs, lintels, and 4 sq. ft. above.
27 B	W. door: Floor offset to sill, both jambs repaired, 5 new lintels, and 6 sq. ft. above. S. door: New lintels and upper 6 inches of jambs.
28 B	W. wall: 2 sq. ft. at middle of floor offset; new door lintels and patch above.
C	W. wall: 6-sq.-ft. patch floor level to door sill.

(Continued)

PARTIAL LIST OF WALL REPAIRS—*concluded*

- 29 B E. door: N. jamb, upper half S. jamb, lintels, and 9 sq. ft. above.
 31 C W. door: Lower jambs, sill, 4-sq.-ft. patch above.
 32 B W. door: Upper S. jamb, 1 new lintel pole.
 34 B E. door: Repaired about lintels, new sill, lower jambs.
 N. wall: 16-sq.-ft. patch.
 35 B S. wall: Patches around ventilators, beam holes, and along floor offset.
 W. door: New sill, lower jambs repaired; 16-sq.-ft. patch S. of door.
 41 B W. wall: Upper 3 ft. rebuilt.
 42 A W. wall: Beam holes repaired.
 B W. wall: Floor offset and 36-sq.-ft. patch above.
 43 B E. wall: Minor patches along floor offset, rebuilt 2 ft. of wall above offset.
 44 A W. door: Minor patches on jambs.
 E. door: Jambs and stairs repaired.
 S. wall: Patched recent hole broken near W. end.
 45 B W. wall: 9-sq.-ft. patch, ceiling poles reset.
 51 A W. wall: 16 sq. ft. repaired, beams reset.
 52 A W. wall: 2 ft. rebuilt; new lintels over opening into Room 51.
 Kiva C E. half of wall built up about 3 ft.
 Court N. side: New wall facing to and above Kivas H and I.
 S. side: New ventilator lintels and various patches, second and third stories.
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